



FRIDAY, JANUARY 18.

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## Steel Rails—Specifications, Tests and Inspection.

With the purpose of getting a somewhat general expression of opinion on the present practice in buying rails and the results in getting what is supposed to be paid for, letters were addressed to a number of engineers of railroads asking their views as to specifications, inspection and tests. The replies got are summarized below. The *Iron Age* at the same time invited an expression of opinion from steel makers, and we are permitted to give, from advance sheets, some of the views so obtained. The inquiry of the *Iron Age* was made with particular reference to the specifications embodied in a paper by Capt. R. W. Hunt, which was read at the Buffalo meeting of the American Institute of Mining Engineers and was published in our issue of Oct. 26, 1888.

Capt. Hunt's specifications we will not reproduce here, but will give a synopsis of them. The specifications of the New York Central & Hudson River are identical with Hunt's except in section 8.

Sections 1 to 6 provide carefully for the admissible variation of section, weight and length, and for sawing, finishing and drilling. Section 7 provides that the number of the charge, the name of the maker, the month and year of manufacture shall be marked on the side of the web of the rail in such a position as not to be covered by the fish-plates.

Section 8 of Hunt's specifications provides that the carbon shall be as high as the maker is willing to put in and still meet the requirements of Secs. 9 and 21. In the New York Central's specifications this section is as follows :

The steel to contain Carbon, .50 to .60 per cent. for 80 lbs., and .40 to .50 per cent. for 65 lbs.

Silicon, .124.

Sulphur, not to exceed, .069.

Phosphorus, .07 to .10.

Manganese, 1.10.

Section 9 provides that test ingots shall be made from each heat, and bars drawn from these bent cold. Sections 10-14 provide for the treatment of the ingots, cutting the blooms and heating. Sections 15-17 apply to inspection. The maker shall furnish the inspector with the carbon determinations of each heat, if so required. The inspector shall have the power to reject rails made from insufficiently sheared blooms, or from heats the test pieces of which have failed, or from badly poured heats, or from "chilled" heats, or from "bled" ingots. The rails made from uncut blooms, if otherwise perfect, to be received as No. 1 short rails, if sufficient lengths have been sawed off to make an amount of steel equal to the original demand of 12 inches. The rails from a badly poured heat, a "chilled heat" or "bled" ingot, to be absolutely rejected. By an imperfectly poured heat is meant one which from any cause has been tampered with without the control of the operator. A "chilled" ingot is one which, from the steel chilling, has to be either pricked or poured over the top of the ladle. A "bled" ingot is one from the centre of which the liquid steel has been permitted to escape. Imperfectly drilled, straightened or chipped or filed rails shall be rejected, but will be accepted after being properly finished.

Section 21 provides for a 5 years guarantee against breakage or unusual wear.

The Pennsylvania Railroad specifications are as follows :

1. The steel used for rails shall be made in accordance with the "pneumatic" or "the open-hearth" process, and contain not less than 0.30 or more than 0.50 per cent. of carbon.

2. The result of the carbon test of each charge, of which the Pennsylvania Railroad Co. is to receive rails, and of which an official record is kept at each mill, is to be exhibited to the rail inspector.

3. A test bar, three-quarters of an inch wide, and about 10 in. long, to be taken from the web of a rail made from each charge is to be furnished to the railroad company's inspector, for use in making analysis and test of the steel, whenever required.

4. The number of the charge and place and year of manufacture shall be marked in plain figures and letters on the side of the web of each rail.

5. The weight of rails shall be kept as near to standard weights adopted by the Pennsylvania Railroad as it is practicable to do so.

6. The sections of the rails shall correspond with the respective templates showing the shape and dimensions of the different rails adopted as standard as near as practicable after complying with section 5.

7. The space between the web of the rails and template representing the splice-bar shall not be less than one-quarter of an inch, nor more than three-eighths of an inch.

8. Circular holes one inch in diameter shall be drilled through

the web in the centre thereof, at equal distances from the upper surface of the flange and lower surface of the head, and three and fifteen-sixteenths inches from the end of the rail to the centre of the first hole, and of five inches from the centre of the first hole to the centre of the second hole.

9. The length of rails at 60 degrees Fahrenheit shall be kept within one-quarter of an inch of the standard lengths, which are 30 ft., 27½ ft. and 25 ft. When specially mentioned in the contract, and not otherwise, 10 per cent. of rails of shorter lengths and 5 per cent. of second-class rails will be accepted.

10. The rough edges produced at the ends of the rails by the saw shall be well trimmed off and filed.

11. All rails are to be straightened in order to insure a perfectly straight track.

12. The causes for a temporary rejection of the rails are :

1. Crooked rails.

2. Imperfect ends (which, after being cut off, would give a perfect rail of one of the standard short lengths).

3. Missing test reports.

4. A variation of more than one-quarter of an inch from the standard lengths.

13. The causes for a permanent rejection of a rail, as a first-class rail—

1. A bad test report, showing a deficiency or excess of carbon.

2. The presence of a flaw of one-quarter of an inch in depth in any part of the rail.

3. A greater variation between the rail and splice-bar than is allowed in paragraph No. 6.

4. The presence of such other imperfections as may involve a possibility of the rail breaking in the track.

The specifications of the Erie are very brief. They fix the admissible variations in section, weight and length. The result of the carbon test of each charge of which these rails are to be made, and of which an official record is kept at the works of the first part is to be shown to the rail inspector.

The following defects shall constitute a permanent rejection of a rail: A report showing a deficiency or excess of carbon; a flaw of one-fourth of an inch or more in depth in any part of the rail. Too great a variation between the rail and the splice-bar, provided splice-bar is correct to template.

The rails are guaranteed for five years.

We will now give the substance of the replies received, as fully as seems desirable, or as we are permitted to do. One distinguished engineer says:

In specifying rails I have followed others more conversant with the subject. I am particularly ignorant of chemistry—a science which causes me to marvel at the powers of the human intellect and to regard its votaries with a kind of savage respect. You will therefore gladly strike my name from your list of possible contributors.

Fortunately most of those addressed were not so diffident. One chief engineer of a trunk line writes:

Instead of tests made by the company, we accept a guarantee for a number of years from the manufacturers, which is evidently the simplest way of getting good rails, and no corporation can nowadays exact both. In other words, we must either tell the manufacturers how to make the rail and then stand by the result, or leave it to him and accept his guarantee.

Under our contracts we have the right to examine the results of analysis made at the shop, and we see to it that the rail is properly rolled to the standard section, is straight and without flaws.

The New York Central and the Pennsylvania specifications we have given above. Mr. Katté concurs generally with Mr. Hunt's views, as given in the paper quoted from. Mr. W. H. Brown, of the Pennsylvania, says: From our observation and experience we find that the rails now furnished this company improve in the wearing quality and strength. We have very little or no trouble of late years from broken rails, since we keep the amount of carbon within the limits of 0.30 to 0.50 per cent.

Mr. J. T. Richards, Assist. Chief Engineer of the Pennsylvania, speaking of the specifications given above, says:

These have been formulated gradually and from experience in the wear and breakage of rails, gathered through a long series of years, and if they are not perfect they are the best we can put forth at this time. As you know, there is a great difference of opinion among engineers and managers of railroads on this subject, and, in my opinion, it is right that there should be, as the traffic and also the extremes of temperature are so widely different on the railroads of the United States, even though they be not many miles apart; hence it would be manifestly impossible to establish an absolute rule as to the chemical and physical characteristics of rails to which all the railroads could conform.

Mr. Jas. O. Osgood, Chief Engineer Lake Shore & Michigan Southern, says:

I am not prepared to state just what chemical tests I should recommend, but in my opinion it is very desirable that chemical tests should be made which will secure uniformity of material and regulate the amount of carbon and phosphorus. Rails as ordinarily furnished I have generally found too soft to wear well, and I believe, with proper care in regard to the chemical constituents, that a hard rail can be obtained which will be much more serviceable than the ordinary product of the mills, and which will not be subject to much breakage.

In addition to any chemical tests which may be required, much more than ordinary care should be taken in straightening rails and in inspection for surface defects. No doubt physical tests or the material should be had also. I consider the present practice of rail inspection entirely inadequate to secure proper results.

Mr. J. D. Hawks, Chief Engineer Michigan Central, who is known as a careful observer and student of rail wear, writes:

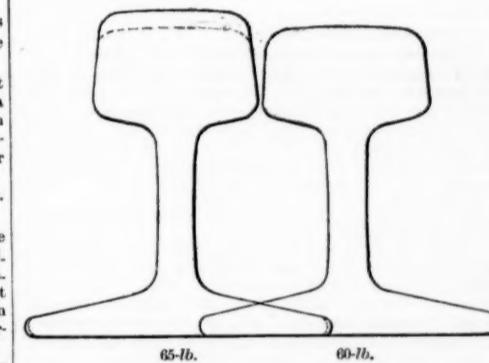
I am entirely at sea in regard to proper specifications for steel rails. I am satisfied in my own mind that the difficulties we have had of late years from soft rails are largely owing to mechanical construction. I cannot learn that any less pains are taken with the quality of material than formerly, and never yet have seen a soft rail myself with a thin head, our trouble in that direction having been entirely with the 65-lb. rail, which

has a head out of all proportion to the size of the rest of the rail. The head is so large that in order to get the rail through the rolls before the neck and flanges get too cold for rolling, the head has to be kept at altogether too high a heat to produce satisfactory results. Our new 80-lb. rail is designed to obviate this difficulty. If it is not a success in this direction, then the rolling mills have got to get up some other excuse for making poor rails. I think the Michigan Central has met every excuse, except this latter one of the large head, that the steel men have offered. We have shown them that their rails are laid on a good roadbed with an abundance of ties and good joint fastenings, and have also shown them that the excuse they make of heavier and faster traffic is no excuse at all on our road, as we run the heavy and fast traffic over some of our old 60-lb. rail with the same conditions as to roadbed.

The soft rail that I have had trouble with has always been very coarse grain. A piece taken out of the head, or even the entire head, and forged down under a steam hammer, will show fine grain.

There have been, of course, a great many suggestions offered as to manner of inspecting rails. We try to have our rails carefully inspected for flaws, splits at the ends, and crooked or lumpy surfaces and lines. The physical tests have not so far amounted to much, and I am at sea as to what really constitutes a proper physical test, especially in view of the fact that where I have undertaken to specify certain physical qualities that the rail should possess, the rolling mill has refused to sign the contract. It is true that it has been my misfortune to undertake to insert these qualifications in the contract on a rising market. If I could catch the market on the drop after the rail contract was as good as closed, I might be more successful. I have, of course, great hopes that our new 80-lb. section will give us much better results than the 65-lb. section. The mill people have only of late years complained about the 65-lb. section being too large in the head. The theory of this large head was perhaps good enough at the time the large head was first adopted.

I inclose sketch showing how the large head came to be adopted on the L. S. & M. S. You will notice that the section of 60-lb. rail is in the light of the present experience a very good one. The same distance between flange and head was maintained on the 65-lb. rail and the five pounds was added to the head, ex-



cept a very small bit on the extreme end of the flange. The rolling-mill people did not object to this at the time, and since then on many roads the idea has been carried still further by adding more weight to the head in a 70 and 75-lb. rail.

While the theory of this addition to the head is that after a quarter or half an inch of the material is worn off the head there will still remain as good a section as the original lighter section, the practice shows altogether a different state of affairs. The 60-lb. rail that we still have in track has a thin and light head.

It has been subjected to very heavy traffic for 15 or 16 years, and will not show one-eighth of an inch worn off the head during all that time. If the 80-lb. rail will give us as good service as this old 60-lb. it is all that I ask. I do not expect any better service, but shall be very well satisfied with rail that will last under our traffic for 15 years.

We certainly have not had anything of the kind since we have adopted a 65-lb. section, either of American or English make.

The 80-lb. rail will be laid with a very much improved joint fastening, as compared with the short four-hole splice of the 60-lb. rail, and should give better results on that account. In fact, much of the 60-lb. rail was laid originally with chairs with only a two-hole splice. It stood this kind of a joint very well, and because it did stand with a chair for an anvil, it shows to me that the railmen are paying altogether too much attention to the style of joint that should be used. The joint being outside of their contract, they have found it convenient to lay a good share of our trouble from soft rail to poor joints and joint fastenings.

Mr. Robert Sayre, Second Vice-President Lehigh Valley, is another engineer who has given especial attention to rails. He writes :

I have never prepared a specification for the test of rails for the reason that we obtain almost all our rails from the Bethlehem Iron Co. and depend upon it furnishing us with a good rail, and as we are near the mill we can return any failures.

The only specification I have is with regards to the carbon. I have raised this from 0.40 to 0.45 to from 0.50 to 0.55 and am considering the propriety of limiting it to 0.60. I believe this right. As we use a heavier rail I think we can use a higher carbon and get better results.

The Chief Engineer of an Eastern line carrying a very heavy and fast traffic writes:

This company has been trusting the mills that roll the rails, and I do not think they are up to the proper standard. They are considerably inferior to English rails—at least those made some 15 or 20 years ago. We have taken out of this company's main line this summer John Brown rails that have been in the track since 1868, 60 lbs. per yard, and they were not so much worn but that they will be good for a number of years yet. I have doubts if our new rails, which have only been in the track

<sup>1</sup>This rail was shown in the *Railroad Gazette*, Dec. 7, 1888. It has a head 2½ in. wide and 1½ deep, containing about 42 per cent. of the total metal. This head is relatively considerably lighter than most modern sections.

a short time, will last 15 years, especially those put in on the main line.

**Col. H. S. Haines, General Manager of the "Plant" lines, writes:**

I have the disposition and I wish I had the time to express my views at length on this subject; they would not be very technical either. I started out years ago with that end of the investigation, and the further I have gone the less occasion I have found for applying my information either chemically or mathematically to the determination of the qualifications of a good steel rail; or, to put it in a different way, to find out in advance the best rail for our purposes and to know when we have got it.

Of late years the impression has been growing on me that the designers and manufacturers will have to specialize in this branch of railroad engineering as has been found necessary in other branches. That is to say, that what is wanted in the way of a rail for a rock-ballasted road is not what we want in our territory where, for instance, in 1,000 miles of road in our system there is not one mile of rock or gravel ballast or any probability of obtaining it. When we first began to use steel rail, its cost being so excessive as compared with iron rails led us to use a light section, that is 50-lb. As our equipment and train-loads increased in weight, we have replaced it in a great measure with a 60-lb. section. On taking up the 50-lb. rail, we found them bowed at each end as if the base had become lengthened under the rolling of the trains, and yet very little wear on the heads. For instance, in taking up a number of rails near Savannah where our traffic was the heaviest and where they had been down 10 years we found a loss by wear of about 3 lbs. per rail of 30 ft. This may be accounted for by our exceptionally low gradients and long tangents, but it is a fact, or at least we consider it one, that the trouble with us is not the wear of the head but the bending upward of the rails at the ends, which would seem to show that rock ballast will wear off the head of a rail faster than it would wear on an unballasted road and that in designing a heavier section for our sandy road-beds we do not need so much metal in the head of the rail, but we must seek to make the rail higher and perhaps broader. With that end in view we have recently designed a section of a 70-lb. pattern, five inches high and with a base of five inches, using the same metal in the head that we now use in our 60-lb. rail; that is to say, we are providing for increased stiffness and not for increased wear.

**A western engineer says:**

For physical test of rails the Pennsylvania Railroad specification seems to be in the right direction; as to the chemical test I am not prepared to say. The question of the constituent properties of rails is still in doubt. The conditions under which rails are used, laid in track and taken care of vary so much on different roads, and the experience is so different, that the matter has scarcely received sufficient attention for any one to say just what is the proper make up for rails.

**Another Western engineer, who is much more than commonly well informed, writes:**

I think the drop test for rails a good one, so far, that while it does not prove that a rail is a good one, it does indicate what are *worthless* ones; that is, those that are quite too brittle to be safely laid in track, and I think the same may be said of chemical analysis of rails. It may show whether a rail contains too high a proportion of an element which is well known to be injurious to the metal, without, however, showing just what proportion of elements constitute a good rail.

Our analyses of rails so far have not been very satisfactory, but from the work in that line which we now have in progress, we hope to obtain some valuable results.

I would attach more importance to physical tests than to chemical analysis, and perhaps more important than either would be a study of the mechanical treatment of the metal in the manufacture of the rail. Our company prescribes neither physical nor chemical tests in their specifications, but take their rails on the guaranteed plan.

I think there has been somewhat of an improvement in the wearing qualities of rails made within the last 2 or 3 years, though not yet up to the standard of 10 or 12 years ago.

One reason for the failure of rails of recent manufacture is the excessive weight per car wheel which is brought upon them; while old rails which have become "case hardened," so to speak, under lighter rolling stock are better able to stand the crushing force of the present heavily weighted wheels.

**Mr. A. A. Robinson, 2d Vice-President and Manager Atchison, Topeka & Santa Fe, says:**

Up to this time, in contracting for steel rails, we have taken the guarantee of the rolling mills as to the material, only providing for a careful inspection as to the workmanship. I have looked into this subject from time to time, but as there has always been such a diversity of opinion and practice, I have not yet reached a conclusion as to which is the better plan to pursue. Of course, if we employed rigid specifications covering the amount of carbon and other costs, we are quite liable to increase the cost which we will have to pay for rails, and where the rails are used within a convenient distance of the mills, it is a question in my mind if the mill guarantee is not better than rigid specifications until we have reached greater perfection in the manufacture of steel, so that we can know, with greater certainty than at present, the component parts of any individual lot of raw material.

An engineer who has had large experience with English rails, finds those made now much inferior to lighter rails made a dozen years ago. This has been true for several years, and many rails have been taken out of track after 18 months' service. They failed chiefly from flattening at the points. The rails are too soft.

**A Canadian Engineer writes:**

I have almost reached the conclusion that the inspection of rails is a useless service, as under the same specifications and the same inspector, and, I may add, under the same contract, one delivery of rails may turn out hard and brittle, while another delivery may prove to be as soft as lead. My belief is that under the present process of manufacture the makers are unable to insure a specific quality of rail.

**Mr. E. P. Hannaford, Chief Engineer Grand Trunk Rail-way, writes:**

First let us look at the position of the manufacturers now and as existing some 18 years ago, when steel rails were first introduced on this continent as a system. In 1870 the engineers of

railway companies accepted steel rails on the good faith of the manufacturers, with some misgivings and anxiety, it is true; but in those days railway engineers knew but little of the manufacture of steel rails, and as a rule everything was left to the good faith and integrity of the manufacturer, and in some cases a guarantee for a term of years was given. The imported English rails of early years, from 1870 to 1875, gave satisfaction; their wearing life under a heavy traffic was put down at 15 years, and time and service have proved their durability to be equal to the anticipation. Even up to the year 1880 the imported English rails were good in quality, although not so good as during the first five years.

From 1880 to the present time there has been a gradual falling off year by year in the wearing quality of imported rails, until their life cannot be depended upon with any certainty.

The same experience is applicable to rails made in the United States, the earlier made rails are better than those of more recent years.

This falling off in the quality of steel rails has led railway engineers to study the component parts of the rails with a view of helping the manufacturers in their endeavors to turn out good wearing rails.

Now, why are the rails of late years inferior in quality to those of earlier years? The answer is to be found in the demand for rails increasing the competition, and in turn decreasing the price. Thus, rails in 1880 to 1885 at the mills' mouth, in England, worth from \$80 to \$90 per ton, and in the United States from \$115 to \$120 per ton, are now down to \$20 in England and \$30 in the United States. It is useless for railmakers to say that the same ore is used, and the same care in manufacturing Bessemer steel rails is exercised now as in previous years, because facts prove the contrary. The failing wear of rails of recent years' make is evidence against such assertions.

The manufacturer who was in business in the early years knows all about the reasons of the failing away in quality, but he cannot restore the lost elements of wear. The enormous demand and output exacts his attention, and the competition in price precludes his reverting to what are termed the old-fashioned methods of twenty years ago; but, nevertheless, these original makers know all about it, and the why and wherefore rails are not so good in lasting powers as at their first introduction. Some of the makers have said: "True, the rails of early years wore well; they were hard, so hard that they caused accidents by breakages, which now happily are almost unknown." Not so; rails did not break more in the early years than those laid in later years; but the fact is that the rails of late years are not nearly so good as those of earlier date. And my experience goes to show that rails made by the same maker in 1870 to 1875 will outlast in wear and time two-fold rails made by the same makers ten years later.

Now inasmuch as railmakers of early years under the Bessemer process know all about the cause of the decrease in wearing ability, I approach the point of endeavoring to set them right, with a great deal of diffidence in my ability to do so. It seems to me very much like a patient prescribing for himself and the doctor looking on with placidity, well knowing that he (the doctor) is master of the position.

Having given you the task that railway engineers have before them, I will give you what I consider about the best constituent parts for a 65-lb. rail, gathered from the reports of the composition of rails that have given good and bad results, bearing in mind I do not run the laboratory:

Carbon.....	0.40	Manganese.....	1.10 to 1.20
Silicon.....	0.06	Phosphorus.....	0.07

And by increasing the weight of rails, say, to 75 or 80 lbs. per yard, the carbon may be increased to 0.50 to 0.55.

Now as to the falling weight test. I am not a believer in such, aptly called "barbarous," usages as have been sometimes practiced.

The great object to arrive at is the toughness of steel at its maximum of hardness. A weight of 2000 lbs. from 18 ft. to 20 ft., two or more blows applied will test this; and if the material is tough, that is sufficient: but if it snaps off then there is the presence of too much phosphorus, or sulphur in the ore, i.e., when the above quantities of carbon, silicon and manganese are used; and it must always be remembered that the bulk ore should be chosen with a natural minimum percentage of phosphorus and sulphur, and that if ores are used with a natural high percentage of phosphorus and sulphur, then the extraction or reduction of these injurious elements has to be done by what is known as the "basic process," and a good rail cannot be relied upon.

I cannot divest myself of the feeling that much of the failure of latter years is the result of using ores inferior to what were used when Bessemer rails were first introduced, and in closing I desire again to say that while we maintenance engineers can give railmakers results, yet we are only secondary to them in knowing how to overcome the cause of failures. All the engineers' prescriptions and rail inspectors' elaborate reports will not, in my opinion, secure wearing service equal to rails made 15 and 20 years ago.

I believe that rail makers are desirous of making good rails, but the market price and tonnage output limits these conditions, and that if a rail maker turns out rails as good as those from his neighbor's mill it satisfies his conscience, and if they are not as good, then the railway engineer or inspector will possibly come in for a good share of the failure as participating in manipulating the ingredients making up the rails, and the more the patient interferes with the doctor the worse in my opinion it may be for him. Let us look at net results, the doctor to effect the cure or blame him for incompetency.

**Mr. W. F. Mattes, Chief Engineer and Manager, West Superior Iron & Steel Co., writes:**

Physical tests upon specimens cut or forged from pieces of the rail, or forged from sample castings of the heat, have little or no value. The drop test, undoubtedly, gives some indication of the toughness and safety of the rail, but throws little light upon its wearing qualities. I am inclined to think that a torsional test upon specimens several feet long, recorded by a large Thurston machine, would give much more information than a drop test. The demand for harder rails which has set in within a comparatively recent period, will very likely result in some of our leading railroads establishing a test for hardness.

If I were purchasing for a large railroad I would analyze occasionally. I would want to know that phosphorus and sulphur were within bounds, and that the manufacture was systematic; and yet, after all, we find ourselves unable to tell very much about the value of a rail from the record of its con-

stituents. Within the proper limits for the various elements there is room for very wide differences in the actual qualities of the rail.

There are two objects in inspection. First, to see that the rails are mechanically perfect, and second to know that they are made of good steel. The first is easily accomplished by a man having such experience as has usually been acquired by the ordinary inspector. To be of much value in the direction of the second requirement, the inspector should be thoroughly familiar with every stage of the manufacture, and conversant with the various conditions that affect the ultimate condition of the steel. To such a man the ordinary physical and chemical tests are useful only as an occasional check.

I believe the average output to be more uniform in quality than formerly. With some mills I know this to be the case. While much has yet to be learned, the years have brought their lessons, and the various processes are now under better control. I think also that most of the mills are now turning out harder rails than they were, perhaps, one year ago. Of course such steel will show higher resistance under test. Whether it will be more liable to breakage in the track, remains to be seen. There is some danger in going too far in this direction with the light sections generally used.

(TO BE CONTINUED)

#### The Johnson Interlocking Machine.

The interlocking machine which we show in this issue was designed to avoid certain defects in other modern machines, and to give a simple, strong and easily accessible locking. The locking system is one of the oldest, the Stevens, but is actuated by the catch rod. All the locking is arranged in a single tier, and in a vertical plane, making examination of the locking very easy. There are only three styles of locking-dog, and these accomplish very simply all ordinary and special locking. Any part of the locking may be removed or altered, without disturbing, locking having no relation to the alteration. The various wearing parts are of cold-rolled iron and steel. As regards the catch actuation, it is claimed by the makers that this machine has the simplest and most durable movement extant. Both the Saxby & Farmer locking and the Stevens locking have been used so long that their weaknesses and merits are well-known, or are easily ascertained, and it is unnecessary to make any comparison of the two types here. The Saxby & Farmer is, in fact, much the most widely used of all systems the world over, and is the only system which has been largely used in the United States. It has certain defects, but the great extent to which it has been used for many years is evidence enough that the balance of merit is so far in its favor. The Johnson machine, as here shown, has however, a considerable advantage in the accessibility of the locking for repairs or changes, and in the simple and strong form of the locking dogs. Although the amount of wear of the mitre lock might be supposed to be objectionable in a lever-locking machine, it can hardly be so with catch-rod locking.

It is generally acknowledged that the locking should be actuated by the preliminary action of the spring catch rod, and one of the most important reasons for this conclusion is that with direct attachment of the locking to the lever it is often difficult to determine, when a lever cannot be moved, whether the working connection or the locking is holding it. In busy places, where the operator is in a hurry, unnecessary strain is often brought to bear on the locking in such a case.

Fig. 1 is a sectional side elevation, and fig. 2 a back elevation, of a four-lever Johnson machine; 1, 2, 3 and 4 are wrought-iron levers, centered on a girder 4 attached to legs A<sup>1</sup> A<sup>2</sup>. The stroke of these levers is limited by portions of the segments B, which form in combination with the spring catch C the well known means for holding the lever in either its home or its reversed position. The segments are carried by front and back girders D and E, which in turn are supported at their ends by the beams F F' and braced by being bolted to the beam G. The three girders are made for spans of 4 and 8 levers. The switch rods are connected to the levers at H. The gain stroke lever K being used for wire connected signals only.

It will be seen that the interlocking is all beneath the floor level, and is easy of access as that portion of the floor, which is adjacent to the windows, and rests at one end on the ledge D<sup>1</sup> of the girder D, is cleated and removable. The active and silent movements of the catch-rod are communicated to the locking tappet N by means of the connecting-rod S and small reversing rocker R centered at P to the brackets O O', which are bolted by turned bolts in reamed holes on the main lever. The locking tappets are connected to the reversing rocker by a friction roller, which fits the curved slot in the rocker, and is centered by the jaw T. If the tappet N were locked in the position shown, it will be readily seen that it would be impossible to raise the catch, by turning the catch handle V. In case the tappet N is free, the intention of moving the main lever, as expressed by grasping the handle, and raising the catch, will raise the tappet and effect all the locking of other lever catches necessary to the safe movement of the lever in question. This movement also brings the curved slot in the rocker R radial to the centre of the main lever, so that the result of reversing the lever is a silent action upon the locking tappet. As the catch is dropped in the reversed position of the lever, the tappet N is raised further, and effects the necessary releasing of those levers which should be released when that lever is reversed.

The action of one tappet is made to release or lock other tappets as the case may be, by transverse connections and dogs carried by the locking plate U, which also serves to guide and retain the tappets. By reference to fig. 3 this will be seen more clearly. Here is shown a front view of a locking plate for eight levers, of which Nos. 1 to 8 are the tappets, of

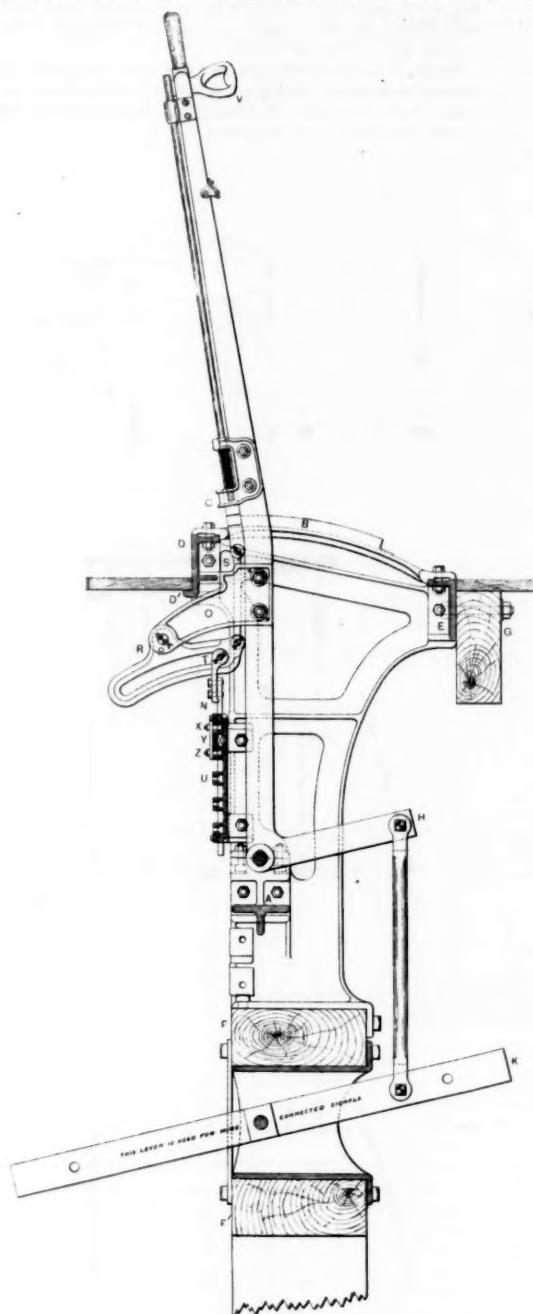


Fig. 1.

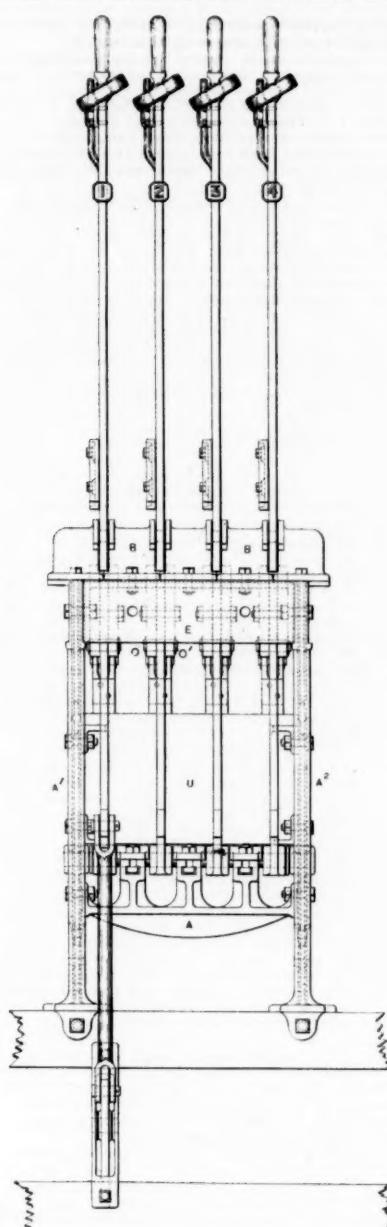
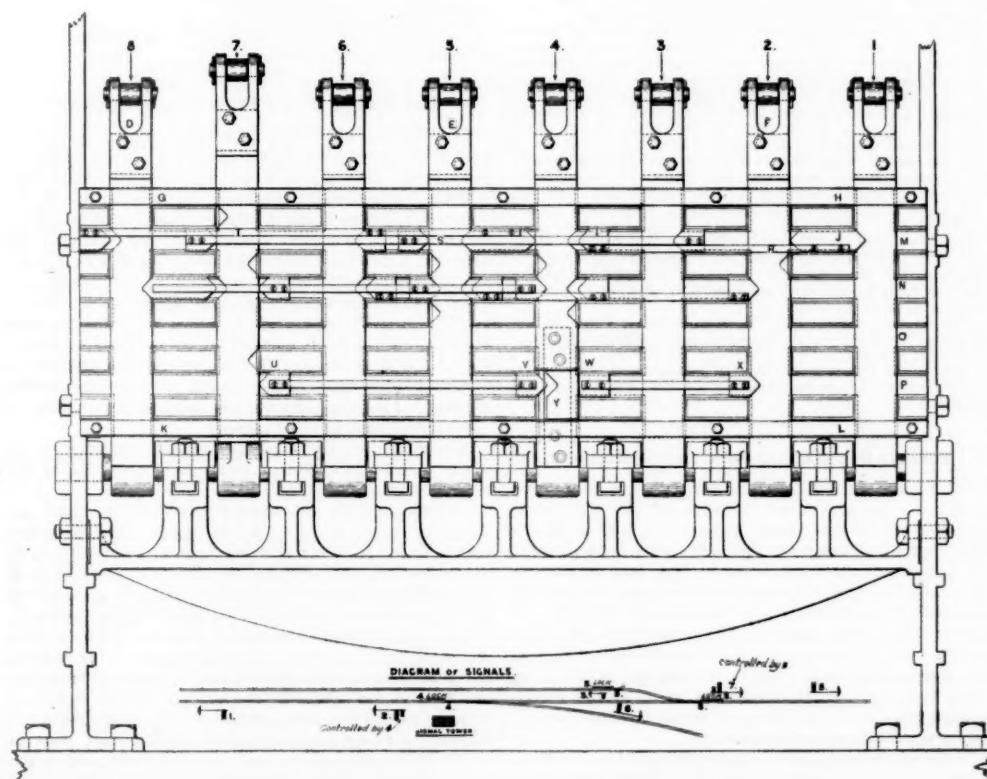


Fig. 2.

Fig. 3.  
THE JOHNSON INTERLOCKING MACHINE.

cold rolled iron, free to slide vertically in planed recesses of the cast-iron locking plate, and retained by wrought-iron strips *G H* and *K L*. All the tappets are shown in their home position except No. 7, which is reversed. The malleable jaws *D E F*, etc., carrying the friction rollers, are set screwed to these tappets as shown. Transverse planed grooves *M N O P* carry the cold rolled dogs *I J*, etc. These dogs are connected where necessary by the  $\frac{1}{8}$ -in. square cold rolled bars *R S T*, etc., which are fastened to the front of the dogs by small steel machine screws. By a recent improvement, for which protection has been claimed, three connecting bars may be used to each line of dogs, so that the locking requires less than half the space it formerly did when only one connecting bar could be used to each space.

The locking dogs with their connecting bars are retained in their recesses by small straps and bolts, shown at *X Y Z*, fig. 1. The bolts are carried by *T* slots cored in the locking plate.

The locking shown in fig. 3 applies to the safe working of a single line junction.

The following is the locking sheet:

**LOCKING.**

Lever.	Releases.	Locks.
1		$2^{\circ}, 4$
2	1	$1, 4, 6$ (when 4 is home), 5.
3		$5, 7$
4	3, 6	$1, 2$ between stroke 7.
5	3	$2, 7$ between stroke 8.
6		$4, 2$
7	8	$5, 3, 2$
8		$7$

\* Reversed position.

The functions of the levers are as follows:

1. Distant signal.
2. Home signal (2 blades).
3. Siding signal.
4. Switch, lock and detector bar.
5. " " 2 " 2 "
6. Home signal.
7. Home signal (2 blades).
8. Distant signal.

The action of the dogs upon the tappets is so simple that the drawing will explain itself in this respect, and will be perfectly understood when compared with the locking sheets. It will be well, however, to draw attention to the method of performing the special or conditional locking. By reference to the locking sheet it will be seen that 2 locks 7 when 4 is home, but not when 4 is reversed.

This lock is accomplished by *U V Y W X*, in the following way. *U V*, and *W X*, are four dogs, connected as shown. *Y* is a transverse sliding section of the tappet 4, being rabbed into the main tappet, which has a gap at this point holding the slide *Y*. The slide has a mitre notch, which, when 4 is home, comes opposite to the dog *V*, so that 2 may be raised together with 7 when 4 is thus, as the aforesaid notch of the slide *Y* is simply made to coincide with the dog *V*, by the tappet 2 thrusting the dog *X* outward. But suppose the tappet 4 is first raised, then the solid portion of the slide *Y* will just fit between the dogs *V* and *W*, thus forming a rigid connection between the dogs *V* and *X*, making it impossible to have 7 and 2 raised simultaneously.

It will be noticed that this special locking is very simple; all its parts being in the same plane, and on the same principle as the ordinary locking. By this method of special locking any conditional lock may be performed.

Although the locking is very rigid, when a catch is free the movement of the locking offers slight resistance. The ordinary and well-known catch-handle is supplied instead of the twist-handle shown, when preferred.

The Johnson interlocking machine is manufactured and supplied by the Johnson Railroad Signal Co., of Rahway, N. J., and a small machine is open to the inspection of railroad officers at the company's factory.

**The Widdifield & Bowman Brake.**

On the afternoon of the 10th inst. a trial was made on the Lehigh Valley, of the Widdifield & Bowman electric brake. This brake is in its operating parts the Widdifield & Button brake, which has been known some years, but heretofore operated as a buffer brake. In that form it appeared at the Burlington trials of 1886, and was promptly found useless or 50-car trains, and withdrawn. The cars fitted with the apparatus have been in the service of the Lehigh Valley ever since, but the brake has been very little used. The brake is operated from the axle. A friction collar is fixed on the axle, and a friction pulley, which is brought against this, winds up the brake chain. The contact between the collar and the pulley was formerly secured through the inward movement of the draw-bar. In the present form, the Widdifield & Bowman, the buffer action is abandoned entirely and the frictional contact is secured by the action of the electric current.

The arrangement by which this is done is simple and ingenious. Carried on each truck are two electro-magnets, and on the locomotive one is a battery. By closing a circuit on the locomotive one of the electro-magnets is energized, and the movement of its armature carries up a lever which brings a small friction wheel against the collar on the axle, and a chain is wound up on the shaft of the friction wheel. This operates second lever, which carries the larger friction wheel against the collar on the axle, and thus the brakes are put on, as with the old buffer action. By closing another circuit in the engine cab the second magnet is energized and the movement of its armature releases the brake. The application of the brake is graduated by the strength of the current. To make the device automatic in case of break-in-two

accidents a battery must be carried in the rear of the train, as well as on the locomotive, and there is a contrivance to close the circuits in both sections automatically, in case the conductors are broken. Of course, if a train is broken into more than two parts the brakes on the middle part do not apply.

The whole scheme is ingenious in details but not new in the general character. The idea of winding up the brake chain by the rotation of the axle has been used by various inventors, Westinghouse among others; and the combination of this idea with an electric conductor, for simultaneous application of the brakes through the train, is shown in the Achard brake illustrated in the *Railroad Gazette* in 1887. In this latter apparatus the friction pulley hangs like a pendulum, and is attracted to the axle by a powerful magnet.

In the trial of Jan. 10 the Widdifield & Bowman brake was applied to a train of 15 Lehigh Valley box cars weighing about 21,000 lbs. each. The train consisted further of an eight-wheel locomotive, 32 tons; a day coach, 18 tons, and a special coach, 37 tons. The locomotive and the coaches were not braked.

The run was from Perth Junction to Three Bridges and return, and stops were made both ways. Going out the stops were:

	Miles per hour.	Distance, ft.	Time, sec.
Emergency.....	24	340	.....
Service.....	29.5	680	.....
Emergency.....	33.5	680	28 2-5
Service, graduated.....	33	1,360	31
Breakaway.....	18	250	.....
Brake applied from top of car.....	32	.....	27
Emergency.....	23	416	16
Engine cut loose, application from rear car.....	13	.....	quick

On the return trip similar stops were made with much the same results, and trials were made also to ascertain the quickness of release. In all of these stops the brakes were applied when the locomotive was opposite a mile-post, and the time taken to stop was observed by a stop-watch on the locomotive. The distances were estimated from the known lengths of the cars. The grades were not noted but were gently undulating. There was nothing very scientific or rigorous about the performance, but it sufficed to show that under ordinary circumstances the brake will stop a train in a reasonable time and space and with great smoothness. Very likely much more could be said of it, but nothing more was demonstrated at this exhibition.

A number of railroad officers and the representatives of technical and daily papers were on the train for the purpose of watching the trial.

#### The Metric System—New England Railroad Club.

The regular meeting of the club was held in Boston on the evening of Jan. 9, President Lauder in the chair.

The PRESIDENT read a communication from the Central Railway Club of Buffalo, N. Y., inviting the members of the New England Railroad Club to join it in a social meeting to be held at Buffalo, Jan. 23. The Secretary was directed to communicate with each member, conveying the invitation and requesting an answer.

Mr. GEORGE RICHARDS (late B. & P.) opened the discussion: As the railroad service has to do with all of the different tables of measures and weights, it follows that what is best for that service is best for business generally. A very large part of the world has already adopted the metric system. The metric system is a system of weights and measures of perfect and complete decimal character; that is, one in which the multiples are by tens and the divisions by tenths: one in which there are but three units, while that now in use has more than forty, which increase and decrease by no regular scale. It therefore affords freedom from labor in calculation and in converting one denomination into another. Its basis is the metre, which is the unit of linear measure. It is extensively used by European and South American nations, and it is only a question of time when its use will become general. In making up reports of loss or gain, increase or decrease of speed, wear of material, and in numberless other instances, we say so much per cent., borrowing again from the decimal system. We say, for instance, 50.14 miles per ton, or 25.19 miles per hour, omitting the furlongs, rods, yards, feet and inches. Many objections are raised to the adoption of the metric system; but when tested they will be found to be imaginary, and will drift away. The united action of the railroads could settle the matter in a day.

Let us cast aside the old system, or lack of system, with its useless and misleading terms, its inches, feet, furlongs, ounces, drachms, cords, pounds and tons, and substitute for this simple and efficient method, the substance of which can be written upon a card no larger than the hand; and with it we can

"Measure earth, weigh air, and state the tides,  
Instruct the planets in what orbs to run,  
Correct Old Time, and regulate the sun."

Mr. C. H. Swan, Mem. Am. Soc. C. E., gave a brief history of the system, and explained at length the metre, the unit of length; the litre, the unit of capacity; and the kilogram, the unit of weight; their divisions and subdivisions, upon a decimal basis, whence they were derived, and their relations to each other, illustrating his statements by the actual weights and measures used in this system.

The metric system is about one hundred years old, it having been first proposed in 1790. Since then it has been adopted by the following countries: France, French Colonies, Holland, Dutch Colonies, Belgium, Spain, Spanish Colonies, Portugal, Italy, Germany, Greece, Roumania and Mexico; New Granda, Venezuela, Ecuador, Peru, Brazil, Uruguay, Argentina, Chile and other South American States; Austria, Norway, Sweden, Switzerland, Hayti, Mauritius and the Congo Free State. Its use is permissible in Great Britain, India, Canada and the United States.

Its simplicity constitutes the great merit of the system. The objections resolve themselves into this, that persons who are accustomed to a certain method don't like to change, even though another one proposed may be better. There can be no objection to the system itself.

Mr. FREDERICK BROOKS: The advantages of the metric system over any other are very great, and are practically admitted. The real objection to its adoption is that it is difficult to make the change. I think, however, that there is a practical consent to the fact that the change is to be made, because it is not creditable to human nature that man

should continue in the use of a system so obviously inferior. To my mind this change is to be looked for, and it should be attempted in as intelligent a way as possible.

The objection to the metric system sometimes takes the form of a suggestion that some of the old measures had better be adopted and used as the basis of a new system instead of the metre; and in that form of argument we detect the real objection: the objector does not want a change. The proposition to decimalize the foot comes from the civil engineer, who already uses it in that form; and the proposition to decimalize the inch comes from the mechanical engineer, who would be suited by it.

Mr. MARDEN: I cannot see any difficulties in the way of its adoption, and I believe in the use of the names that have already been given to the weights and measures; they certainly should be uniform. I suppose, Mr. President, if you and I should recommend the use of the system in our respective shops to our different companies, it might have considerable weight, and probably there would be but little objection to our using it. Heads of departments of roads throughout the country should give the matter their personal attention. Would it not be well for this club to recommend the Executive Committee of the National Association [of Master Car-Builders] to appoint a special committee to bring the subject of the metric system of weights and measures up for consideration. In order that such an expression may be had, I move that such a recommendation be sent to the Executive Committee through our Secretary.

Mr. ALLEN: In the Institute of Technology I teach the students the best methods of using the metric system, in staking out railroad lines, laying out curves, etc., and by understanding the best methods some of the difficulties which otherwise would occur in the use of it are avoided; and in my work with the students I let alone the question of the merit of the system. The objection to a change has not been given sufficient weight perhaps. A yard does not differ much from a metre: they go very well together. Many regard the foot as more convenient than the metre or yard. A measurement of 10 ft. in length is very convenient in surveying and other employments. Many engineers prefer a chain of 100 ft. in length to one of 66; a 30-metre and a 20-metre chain are also used. Earthwork is measured in feet; the results are given in cubic yards, occasionally in cubic feet. In masonry the results are sometimes given in cubic feet, very often in cubic yards, and very often in perches; and a perch is sometimes one thing and sometimes another. The difficulty of changing would be far less in cases of dry measures. Liquid measures could be more easily changed than measures of length. The sizes of timber could be adapted to the metric system, but there are many structures in civil engineering that would be inconvenienced and subjected to expense on account of a change. The serious difficulty is in the work of machinists and mechanical engineers.

There has been serious opposition in different parts of the country to the introduction of the metric system. At the head of the organized personal opposition in one case was Mr. Charles Latimer, who died last year. He was violently opposed to it. I think he had something to substitute for it based on the foot. One of his grounds was religious one, he having discovered that in the Pyramids certain relations existed which led him to believe the foot was sacred in its origin. Another prominent and powerful opponent of the system was Mr. Sellers, and his objection was on the ground that the manufacture of machines for use in machine shops would suffer seriously from a change, especially in the matter of cutting screws. There are many mechanical contrivances in use, and which must continue in use for years, some of the parts of which would suffer from the change. Many machinists and mechanical engineers are unfavorable to the system on account of these difficulties.

Mr. RICHARDS: What is needed here is some combined action on the part of some trade or profession, or some branch of business, to bring this system into effect. A united effort of the railroads could accomplish it, and all the obstructions would speedily vanish. If it should take effect on Monday morning the difficulties would be forgotten by Saturday night. The opposition raised by Sellers ceased to exist many years ago. A certain person searched the United States in vain to find a standard inch; one so accurate that machinists could work by it. The result was that the Master Car-Builders' Association authorized him to make an inch for their use. There is no way at present of keeping fine measures accurate.

Mr. BROOKS: About twenty years ago the American Watch Co., at Waltham, adopted the metric system for their machinery in watch making, and they made a change right through in their screw threads, on all their machines.

Mr. COLEMAN: I was agent in Europe for Pratt, Whitney & Co., and the firm had to make all its machinery for three large armories by the metric system. It was not long before they became thoroughly in love with it. \* \* We are as much old fogies as they are in England, where to-day they regard a Pullman car upon the Midland road as a monster. They have a good many relics of barbarism there. They tell you the weight of a certain thing is so many stone; and the beauty of it is that there are several different weights for a "stone" in different localities. They still call 112 lbs. a hundred weight; and a ton is always 2,240 lbs. Our system is one of the British barbarisms left over. The task of attempting a change in this country is gigantic; but if the break is made among the railroads, that will call the attention of the scholastic institutions to the matter. Perhaps the major part of the change has got to be wrought by teaching the system to the children in the schools, and by and by the thing will get a fair start.

The resolution offered by Mr. Marden, viz.: That the New England Railroad Club recommend that the Executive Committee of the Master Car-Builders' Association appoint a committee on the metric system of weights and measures, to report at the next annual meeting of the Association, was adopted.

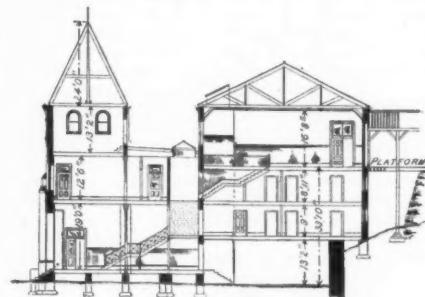
#### Yonkers Depot of the New York & Northern.

The handsome depot illustrated herewith is building at the branch terminus at Yonkers of the New York & Northern railroad. The architecture is Romanesque, with a front of first quality buff face brick and buff terra cotta trimmings. The lintels, sills and outside steps in front are of fine axed Wyoming bluestone. The roofing of the tower is red slate, and that of the building is "Gilbertson's" old method tin plates. The kitchen, boiler rooms, areas and sidewalks are to have a 4-in. concrete base and 1 in. cement surface flooring. The vestibule is to have a flooring of marble mosaic tiling,  $\frac{1}{2}$ -in. thick, and the other floors are to be of best quality Georgia pine. The inside finish is to be of hard wood and trimmings of selected white ash.

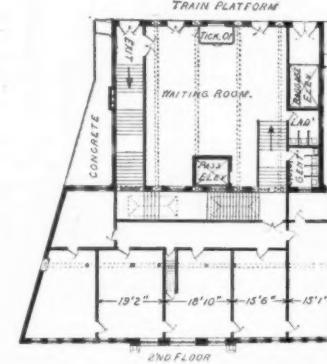
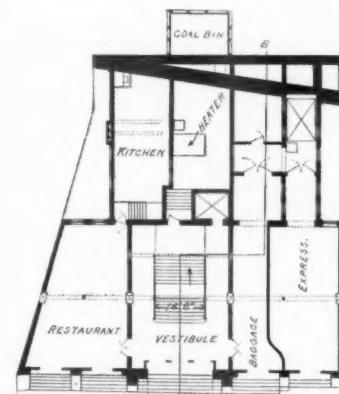
In the rear the depot has been built into and above an old retaining wall, as the trains come in at high level, 34 ft. above Yonkers square in front of the station. The trains run over the streets into dead stops at the rear of the depot. The build-

ing has a front of 93 ft. and a depth of 92 ft. It is 67 ft. wide at the rear, as it tapers on one side. The peak of the tower is 74 ft. above the curb.

The depot is furnished with two elevators, one passenger and one baggage, of McAdams & Cartwright's direct lift plunger type, with lift of 30 feet. The floor plans are shown in sufficient detail in the diagrams.



Longitudinal section on A-B.



The architects are Geo. Edward Harding & Co., of New York. The building contractor is Joseph Perry, Yonkers. The steam heating contractor is James S. Haley, 57 Elm street, New York. The illumination is with Edison's electric light system.

The cost of the depot will be \$30,000 complete, and it is to be finished on April 1, 1889.

#### Locomotive Boiler Explosions in Europe.

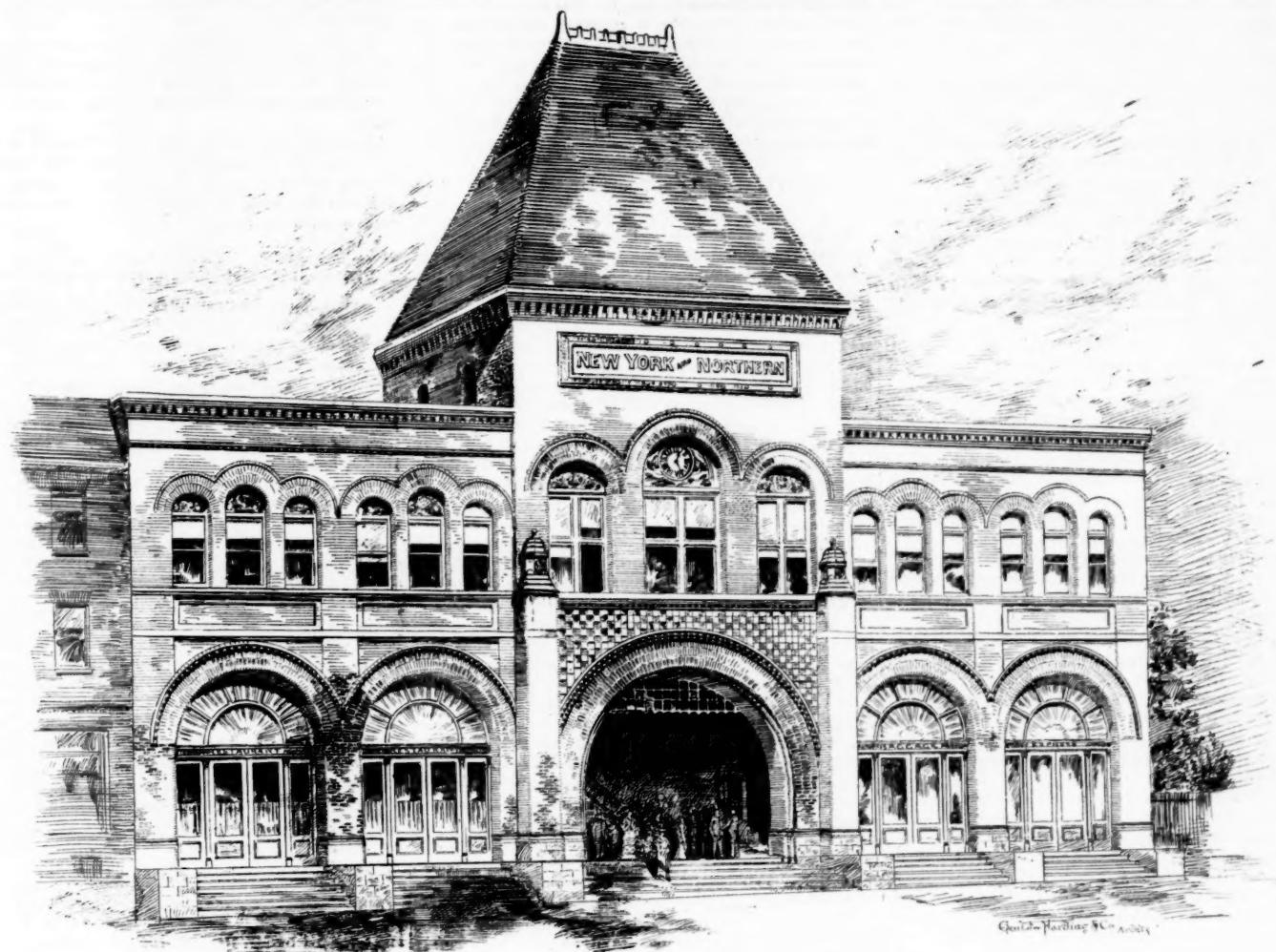
The "Portefeuille Economique des Machines" for December, 1888, publishes a table classifying the explosions of locomotive boilers in several European countries, from 1866 to 1885, together with remarks on the same by Messrs. R. Vinçotte, Superintendent of the Belgian Boiler Insurance Co., and Mr. Walckenaer, mining engineer. Many of the observations are applicable to American locomotive boilers, and the whole discussion will doubtless be interesting and valuable to persons who construct and operate such boilers.

In the causes of explosions, to which reference is made hereafter, it may be remarked that the defects classified as grooving or channeling of the boiler sheets are supposed to be caused by corrosion in every case, while cracks are due to change of form of the boilers, or bending of the plates by unequal expansion or other causes.

The classified table of explosions is presented herewith. In this table, only the explosions which have caused loss of life or serious damage are noted.

The first conclusion to be drawn from the table is that the accidents usually occur at a few definite localities in the boilers, and are due to well defined causes. The explosions of the shell which, in France and England, usually occurred in the cylindrical shell, are most frequently due to corrosion forming grooves or channels, as an effect of change of form; occasionally, but more rarely, ruptures are caused by general corrosion. Accidents to the inside sheets of the fire-box are either collapse of the crown-sheet, frequently due to faulty construction, or breaks in the vertical sheets, following ruptures of the stay-bolts. Among all the explosions in the list, there are none arising from external corrosion, none in the front tube-sheet, nor in the connecting sheet uniting the barrel of the boiler with the outside shell of the fire-box; and only one occurring in the furnace tube-sheet.

Grooves or Channels, Due to Corrosion.—If a sheet cov-



YONKERS DEPOT OF THE NEW YORK &amp; NORTHERN.

ered with a coating of rust is bent so as to stretch the fibres beyond a certain point, the rust cracks and portions of the iron are exposed. This iron again becomes rusted, if in contact with oxidizing agents, the rust is again cracked by flexure of the sheet, and thus the corrosion is continually increased. Should the bending at first occur uniformly along a considerable strip, the corrosion itself will soon limit the flexure, so that after the formation of a groove of a certain depth, or a series of parallel grooves, a single one of the grooves will increase rapidly in depth. In this way it seems probable that the origin of 33 explosions among the 47 accidents of this character mentioned by Mr. Walckenaer may be fixed.

The principal oxidizing agent which produces the results above described, appears to be oxygen dissolved in water. If this is true the grooves ought to occur in the lower portions of the cylindrical shell, because the feed water, on its admission, sinks to the bottom of the barrel and is only slowly withdrawn from this part. Grooving in the lower part of the cylindrical shell does, in fact, occur in the majority of instances, but this does not seem to be the fixed rule, grooves being occasionally found in parts where the water can scarcely contain oxygen; for instance, in the back tube sheet near the fire-box. Hence it is by no means certain that a mode of feeding (such as discharging the feed water into the steam space) which deprives the water of its oxygen would prevent this kind of explosion.

*Cracks Caused by Bending.*—In parts of boilers where there is no tendency to oxidation, above the water level, for instance, flexure alone can crack the sheets, the compression and extension of the fibres of a sheet causing cracks which continually deepen; but Mr. Vincotte thinks that for this action there must be more change of form than in the preceding case. The appearance of a crack is materially different from that of a groove caused by corrosion. The opening

cracked sheet, and fig. 2 is the cross-section of a sheet grooved by corrosion.

*Flexure.*—The bending of the sheets, which gives rise either to grooves or cracks, is sometimes caused by the pressure of the steam on flat plates. The sheet has a bellows action, under the influence of variations of pressure, especially in the curved flanges uniting the sheets to adjacent parts. Other bends are caused by the unequal expansion of the iron and copper sheets. Occasionally these two causes exist in a single sheet, and to this double influence are to be attributed several ruptured joints of the inside shell of the fire-box at the rear. Other bends are produced by the rigidity of the connections which unite the boiler with the frame of the locomotive. This rigidity at the points of attachment prevents the cylindrical shell of the boiler from retaining a circular form when subjected to internal pressure; the sheets tending to bend internally along the horizontal edge of each connection. Fortunately the grooves thus caused are slight, hence the ruptures which occur are rarely serious. But this is not true of flexure along certain lines of the cylindrical shell, either near the seams or in parts of the section deviating from the circular. This kind of flexure causes long grooves or cracks, and the accidents resulting therefrom are generally disastrous.

To explain in what manner and to what degree the vicinity of a riveted seam can cause dangerous flexure, Mr. Walckenaer first examines the case of two flat plates riveted together, of which fig. 3 represents the section perpendicular to the seam. These plates can be regarded as prisms united at  $B E$  and  $B_1 E_1$  in a solid  $C E C_1 E_1$ , which represents the rigid portion of the joint. If two tensile forces  $T$ , equal and opposite to each other, act at the extremities of these prisms, the solid  $C E C_1 E_1$  is subjected to the action of a couple which tends to rotate it around its centre. But this rotation bends the prisms, and the resistance to flexure developed at the edges of the joint soon arrests the solid  $C E C_1 E_1$  in a position of equilibrium. By applying the ordinary theory to this position of equilibrium, Mr. Walckenaer deduces the tension of the fibre most affected, which is situated at  $B$ , as four times the average tension of the sheet. The calculation of the tension  $T$ , made with flat sheets, to simplify the problem, is not exactly the same for the sheets of a cylinder stretched by internal pressure. But it is sufficient to explain that in a cylindrical shell, if  $A B C D$  is the water-surface, the bending of the sheet  $B E A D$  can produce a groove along the axis  $B$ , if the surrounding circumstances are favorable.

Grooves near the longitudinal seams of cylindrical shells have caused, as shown by the table, 22 of the 64 explosions in England, and 5 out of 14 in France. In Belgium only a single one is cited, but this relative immunity cannot be referred to a well-defined difference in the mode of construction of Belgian locomotive boilers. To reduce the flexures due to riveted seams, the sheets can be curved near the joints so as form almost continuous contours with each other. But to prevent them entirely, lapped seams must be discarded,

is small; ordinarily, the edges are uneven, and in cross-section the crack does not extend in a straight line. Fig. 1 is the sketch presented by Mr. Vincotte to give an idea of a

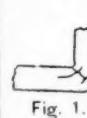


Fig. 1.

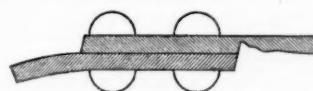


Fig. 2.

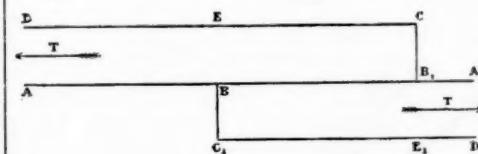


Fig. 3.

#### SUMMARY OF LOCOMOTIVE BOILER EXPLOSIONS IN FRANCE, BELGIUM, HOLLAND AND ENGLAND, FROM 1866 TO 1885.

CAUSES.	France.	Belgium.	Holland.	England.	Total.	
					By causes.	By groups.
Originating	In the cylindrical shell.	Grooves { In the longitudinal seams.....	5	..	22	27
		{ In a line near the seams subject to cracks. { change of form.....	..	1	2	3
		General internal corrosion.....	..	..	2	2
		Corrosion not located.....	..	..	1	1
		Flaws or bad construction.....	1	..	..	1
		Excessive pressure.....	1	..	..	3
		Unknown causes.....	..	1	4	5
		In the outside shell of fire-box. { Grooves or cracks along a line of flexure.....	1	3	1	5
		{ Internal corrosion, not located.....	..	..	2	2
		{ Causes not fully determined.....	..	..		8
	In the dome or at its base.	Weakening of the boiler near the dome.....	1	1	..	2
		Cracks in the flange of the dome, caused by bending.....	1	..	..	1
		Rupture of cast-iron domes or flanges.....	1	..	..	3
	In the inside shell of fire-box.	Collapse of { Due to faulty construction.....	1	..	..	1
		{ From unknown causes.....	1	1	1	6
		Grooving of a vertical sheet or rupture of stay-bolts.....	1	..	6	7
		Grooving of a transverse tube.....	..	..	1	1
		Excessive pressure.....	..	..	2	2
		Various faults of construction.....	..	..	2	2
Due to external causes.....	..	..	..	5	5	5
No details given.....	..	..	..	4	4	4
Total.....	14	7	1	61	86	86

and the double welt joint substituted. A single welt joint will not answer, and would even be a serious defect if it were external, since the groove which would be produced in the plate might then be difficult to discover.

All parts of the cylindrical shell which deviate from a circular contour, tend, just like lapped joints, to produce flexure which may be considerable and whose danger is obvious. Frequently an attempt is made to stiffen the shells of this form of boiler by transverse braces, but even if the reactions of these braces should theoretically balance the effects of deformation, a tendency to flexure in their vicinity would exist, because it is almost impossible to connect the braces exactly at the points of application of their resistances. In addition to two boilers exploding from this cause, Mr. Vincotte mentions 12 others which, when submitted to pressure and examined, after the explosion of the latter, were found to be grooved in the same manner.

*General Corrosion.*—The lower half of the cylindrical shell is often corroded internally all over the sheets in isolated, dished depressions. The sheet is first attacked at a number of points, where concave depressions are formed, which increase more rapidly in area than in depth, the number increasing at the same time until the corrosion becomes continuous. Sometimes, even on old sheets, a portion of the surface is not affected, and in other cases the whole surface is attacked. In either event this general internal corrosion does not appear, according to the statistics, to produce many explosions, for the reason probably, that it has a progressive action which can be inspected by a removal of the tubes.

*Collapse of Crown-sheets.*—In the accidents of this character, noted by Mr. Walckenaer, faulty construction seems to be the principal cause. It is essential for safety to make the crown-sheet perfectly rigid, and this is a difficult problem. According to Mr. Vincotte, in a crown-sheet stiffened by bars, if the whole or too great a portion of the supports of these bars should exert an undue strain upon the vertical sheets of the fire-box, every fault of construction which causes the crown-sheet to become curved, will exert bending strains, and shear the upper stay-bolts, bend the vertical sheets and weaken the structure.

*Rupture of Vertical Sheets of the Inside Shell of Fire-box.*—These ruptures result from the corrosion of the sheets and the failure of the stay-bolts. Copper furnaces, which are the most usual type in Europe, become corroded in the fire space above the level of the grate bars, sooner or later, according to the character of the coal, especially according to the amount of sulphur, and the rapidity of combustion. This corrosion diminishes the thickness of the sheet; but, generally speaking, it is not the corrosion *per se* which causes the explosion. The most dangerous point is that the corrosion eats off the heads of the stay-bolts, and their tendency to be drawn from the sheet is only resisted by the screw threads, and it is well known that this resistance is far from efficacious, on account of the enlargement of the holes by bulging. This double corrosion of the sheet and of the heads of the stay-bolts can be easily inspected. But in making the inspection it must not be overlooked that each stay bolt head which is being eaten away protects the adjacent portion of the sheet underneath; so that when the head is destroyed, this part of the sheet projects in such a manner as to resemble the head of the stay-bolt, and the inspector must be careful to recognize this deceptive appearance.

Broken stay-bolts are also an important cause of bulging and tearing of the sheets, either in the outside or inside shell of the fire-box. Great care should therefore be exercised, when inspecting the fire-box, to discover broken stay-bolts; otherwise the rupture of several contiguous stay-bolts increases the pressure of the sheet upon the remaining stay-bolts, and the unsupported part is stretched until a considerable bulging or an explosion occurs.

Mr. Walckenaer, in discussing the foregoing causes of explosions, says that the maker of the boiler ought to avoid all modes of construction which favor change of form or flexure, especially along extended lines. He should use double welt joints for the longitudinal seams of the cylindrical shell. Cylindrical shells which are not truly circular should be rejected. The shape, the stay-bolts and the bracing of the fire-box sheets ought to be such as to render the bellows action slight and free from tendency to cause long cracks. This action occurs principally at the edges of flat plates, and the joints of sheets at right angles to each other should be made with accurately curved strips having a sufficient radius, never with angle-irons. The curved portions liable to crack ought, moreover, to be capable of ready inspection, both internally and externally. Boilers should not be unduly weakened by the holes cut for the domes.

*Collapse of the crown sheet* is one of the most disastrous forms of accidents. Too much care cannot be used in stiffening this part. The crown bars should be supported by the fire-box, and the supports ought to be attached, in all cases, at right angles to the vertical sheets.

Mr. Vincotte gives two general rules:

1. The strength of the boiler ought to be so proportioned that the strains caused by the pressure of the steam do not exceed the elastic limit at any point.
2. Parts tending to crack by the effect of unequal expansion should have such forms and thickness as to make the maximum opening of the cracks very slight.

In order to diminish the evil effects resulting from the flow of the feed water to the lower part of the cylindrical shell, Mr. Vincotte proposes to furnish locomotive boilers with two injectors, one delivering the feed at the middle of the water space, for use when running, and the other discharging into the steam space, for feeding when the engine is stopped. The user of the boiler, for his part, ought to make internal inspections often enough for the timely discovery of the commencement

and progress of grooves and cracks. The removal, either in part or entirely, of the tubes is necessary for this purpose, and it is a necessity which should be recognized. If grooves are noticed along the seams or in the fire-box, the boiler should be condemned, because it is liable to give way at any time. Finally, Mr. Walckenaer remarks that the explosion of a locomotive boiler demands a very careful inspection of the condition of other boilers having a similar construction.

#### The Iron Ore Trade at Buffalo.

BY EDWARD B. GUTHRIE, C. E.

The great increase in the last three years in the amount of ore handled at Buffalo has gone on with very little attention, considering its magnitude. The receipts of iron ore at that port since 1885 have been as follows, in gross tons:

1885.	1886.	1887.	1888.
7,100	28,430	30,760	246,850

From these figures it is seen that the increase in 1888 has been some 700 per cent. Of the amount received in 1888 all but 26,500 tons had been reshipped at close of navigation. There is now talk of remodeling and starting up the furnace at Ironton, located about 15 miles north of the city, on Niagara River. This furnace has been out of blast 10 or 12 years, and it is rumored that Bessemer pig will be made. Buffalo, with its shipping facilities by water and rail and its cheap fuel, ought to make a good point for manufacturing steel, though its two iron mills have been long out of use.

During the past year three ore docks have been started at Buffalo, one under control of the Lehigh Valley Railroad, on the Tift Farm Improvement, having a length of 2,100 ft. and width of 200 ft.; one controlled by H. K. Wick & Co., located on the Plackwell Canal, 1,460 ft. long by 200 ft. wide; one, the Minnesota Docks, controlled by the New York, Lake Erie & Western, located on Buffalo River, about 500 ft. long by 200 ft. wide.

At each of the first two, three hoisting and conveying machines, made by the Brown Machine Co., Cleveland, O., are used for hoisting the ore from vessel, conveying it back for immediate reshipment on cars, or stocking up on deck. Each machine consists of a trussed bridge, supported by a pier at each end, movable on tracks parallel to the face of the dock. The bridge is 180 ft. long between piers, with a cantilever extension 80 ft. long, for dumping beyond the rear pier, and a hinged projection, 34 ft. long, allowing buckets to be directly over a vessel's hatchway. The height at the dock end is 30 ft., at the rear end 45 ft., enabling the empty buckets to return to the vessel by gravity. The power consists of three double cylinder engines located at one of the moveable piers, operating the buckets, hoisting from the hold, conveying back from the dock, and moving the whole plant from one point to another in a direction parallel to the face of the dock. Each bucket holds one gross ton, and from 1,200 to 1,500 gross tons can be handled with reasonable speed in ten hours.

At the Minnesota docks five McMillan steam cranes are used, which run on a track parallel to the face of the dock. By these the ore is hoisted from vessel and is then either dumped into cars on parallel tracks for immediate reshipment, or into small cars running on trussed girders supported at each end on moveable piers, at centre on a fixed pier, the former piers being operated by hand through gearing transferring the plant from one point to another. The girders are at right angles to the face of the dock, and along them the small cars of ore are pushed by hand, and the ore dumped on to dock where it is stacked. Each bucket is said

to hold 2,800 lbs., and 1,000 tons are handled in 10 hours with the five cranes.

The first mentioned machine is the cheaper to operate, and the most speedy, all the power being furnished by steam and gravity. The first two docks were not in operation until August or September last, while the third was started a little earlier.

The sketch map herewith shows the location of the new docks and of the connecting railroads. The facilities for shipping by rail are good through direct connection with the Buffalo Creek Railroad, which is a local line uniting all the roads to the water front.

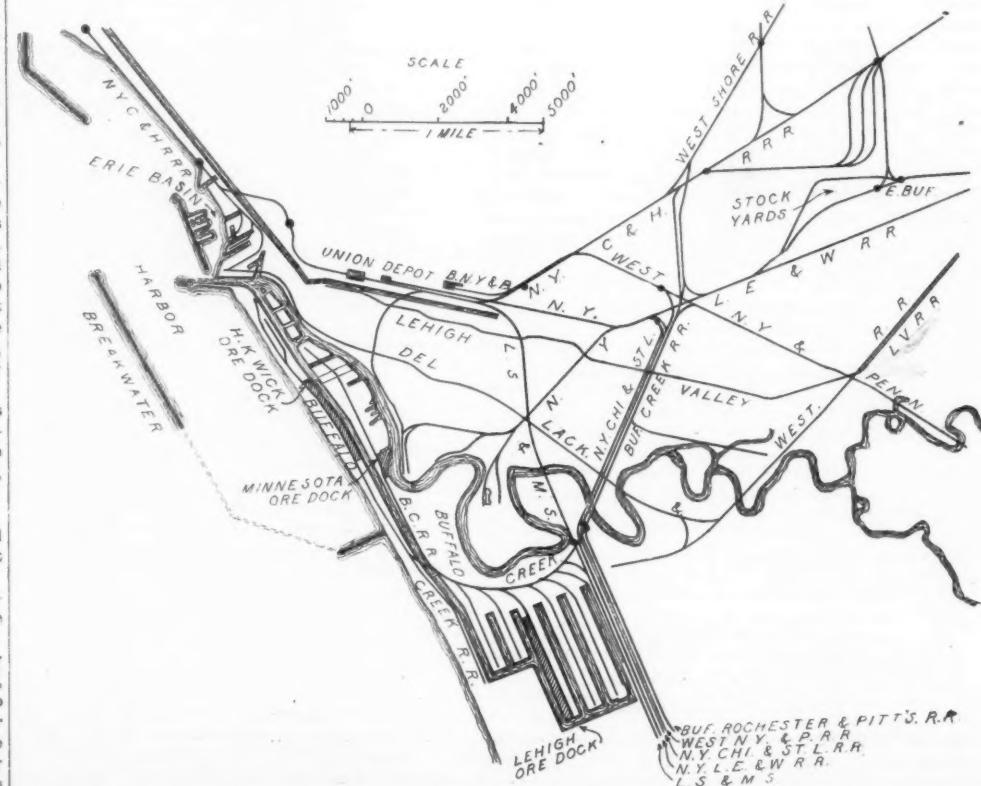
#### Proposed Inter-state Commerce Railway Association.

The meeting of railroad presidents and bankers in New York City, which was noted last week, reconvened on Jan. 10 and adopted a plan of organization. The name of the organization is to be the "Inter-state Commerce Railway Association." The agreement is to be binding when signed by the following companies: Chicago & Alton, Chicago, Rock Island & Pacific, Chicago, Burlington & Quincy, Chicago, Milwaukee & St. Paul, Chicago, St. Paul & Kansas City, Chicago & Northwestern, Chicago, Burlington & Northern, Chicago, St. Paul, Minneapolis & Omaha, Wisconsin Central, Illinois Central, Missouri Pacific, Kansas City, Fort Scott & Gulf, Atchison, Topeka & Santa Fe, Union Pacific, St. Louis & San Francisco, Wabash Western, Burlington, Cedar Rapids & Northern, Missouri, Kansas & Texas, Minneapolis & St. Louis, Iowa Central, and Fort Worth & Denver.

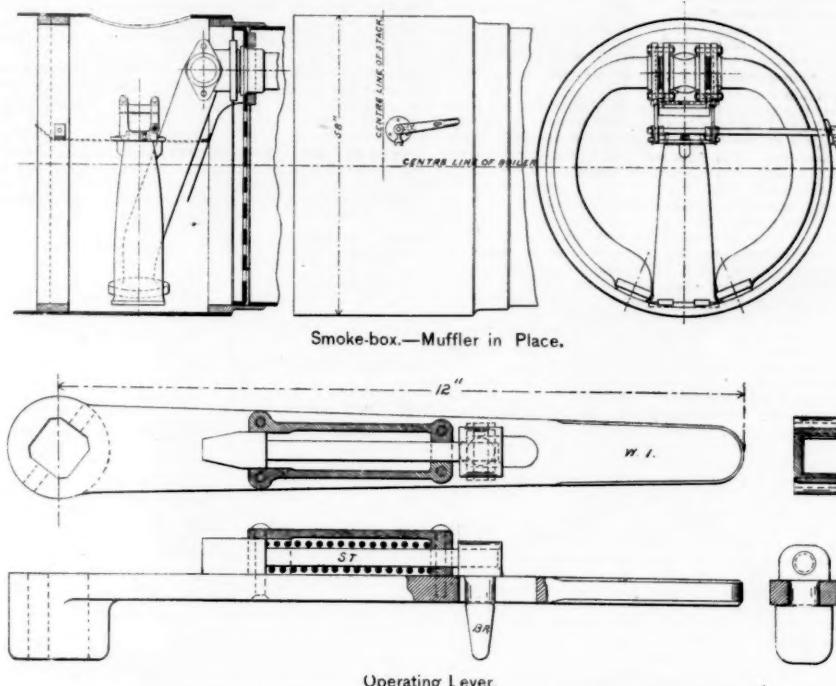
The abstract of the plan of organization is quite long, but its provisions are very similar to those of previous agreements. A clause requiring station agents to report direct to the auditor of the association was adopted, but was stricken out at a subsequent meeting of the presidents. At this later meeting the titles and relations of the officers, and some minor provisions, were also altered. The substance of the whole is embodied in the following resolution, which was unanimously passed:

*Resolved*, That the fundamental principles upon which the plan reported is based, to wit, the enforcement of the Inter-state Commerce law and the arbitration of all differences between companies, be and they are approved, and will be adhered to in perfecting the proposed organization.

Trunk line Presidents Roberts, Depew, King, Mayer, Sloan and Wilbur were present at the conference, and took part in the discussion. A resolution, offered by Mr. Depew and seconded by Mr. Roberts, was unanimously passed by the trunk line presidents, expressing agreement with the main purpose of the meeting, and the opinion that the trunk line presidents should form an association similar to the one for which the meeting was called. A resolution, disapproving of ticket commissions, was voted for by all present except Mr. Cable, of the Rock Island. Mr. Roberts inquired about the position of the bankers relative to building new parallel lines, and was replied to by Mr. J. Pierpont Morgan, who said that, if the proposed agreement was perfected and its provisions enforced, and the bankers could be represented in the executive committee, the houses represented at the meeting would agree to do all in their power to prevent the negotiation of securities for the construction of roads not unanimously approved by such executive committee. The Chicago & Alton, Illinois Central and Wabash were not represented at the meeting, but a Chicago dispatch states that the presidents of the two former are ready to maintain rates under any scheme that may be proposed.



MAP SHOWING NEW ORE DOCKS AT BUFFALO.



PENNSYLVANIA ROLLING STOCK IMPROVEMENT CO., Philadelphia, Pa.  
ADJUSTABLE EXHAUST MUFLER AND DAMPER.

The general plan was formulated by a sub-committee, of which C. F. Adams was chairman. In presenting it he proposed that it should be an association of presidents, to the end that the highest officials of the various companies may be held responsible to one another and thereby be held to a more strict and personal account. Messrs. Cooley, Morrison and Walker, of the Inter-state Commerce Commission, were in New York and had been consulted in regard to the plan. It is understood that the Commissioners heartily approved of it, and a Washington interview states that Chairman Cooley expects "the best sort of results" from the meeting. He regards it as the most hopeful sign since the passage of the Inter-state Commerce law. Messrs. Adams, Strong and Cable were appointed a committee to solicit signatures.

President Stickney, of the Chicago, St. Paul & Kansas City, on the next day after the conference, addressed a long letter to the New York bankers, criticising the scheme adopted, affirming that it deals too much with glittering generalities. He claims that all present difficulties result from illogical plans of tariff making and proposes another plan, which he outlines as follows:

"The objects of this association are: 1. To agree upon a uniform classification. 2. To adopt one class of said classification to be known as the standard rate. 3. To agree upon the percentage above or below the standard rate the other classes shall bear. 4. To agree upon some mathematical plan for building the standard rate. \* \* 7. To discover some plan to prevent the payment of commissions, and to prevent dealing with scalpers.

"For the purpose of effectuating the objects of this association we agree at once to elect a board of arbiters, consisting of three disinterested educated men of high standing, a majority being unskilled in traffic affairs. \* \* It shall be their duty to prosecute all violations of tariffs and rules which at the same time are violations of law, and where such violations of tariff and rules are not violations of existing laws to investigate and report the facts to the public. We agree that all our meetings shall be open to the public, and that state and inter-state commissions shall be invited to attend and participate in the discussions." \* \*

The Minnesota State Railroad Commissioners have petitioned the Inter-state Commerce Commissioners to investigate a complaint against the St. Paul-Chicago roads for alleged violation of the Inter-state law. They recite violations of four articles of the law, and the Inter-state Commerce Commission is called upon to investigate the charges because it has full power to call for persons and papers, which the State Commission cannot do. The violations of the law, the Commissioners say, are secret, and cannot be proven by the State Railroad Commission. The Commissioners ask that a hearing be held at which the roads shall be required to show their earnings and disbursements since July 1, 1888; that the proper officers be required to show what passes and free tickets have been issued, and what commissions paid to scalpers since the date named, and that the officers of the company be required to appear at the hearing and show such books.

President Stickney is said to have inspired this official communication.

#### Adjustable Exhaust Muffler and Damper.

This simple device consists, as shown in the drawings, of a small iron frame carrying a piece of coarse wire gauze arranged to swing over the exhaust nozzles of the engine inside the smoke box.

By means of the rock shaft and lever attachment on the outside of the smoke-box, the device can be moved on or off

as required. The end of the small lever is generally connected with the hand rail on the fireman's side of the engine, and when thus arranged a simple twist or turn of the rail will operate the apparatus. In that arrangement the spring shown in the engraving is not necessary. When in position as shown in the plans, the wire gauze is 3 in. above the tip of the exhaust nozzle, and is supported in that position by four small arms or levers. These are pivoted at the points shown and swing the apparatus into position and back again as required.

The adjustability of the device is important, as it enables the apparatus to be under perfect control of the fireman, to be used at starting from stations, moving about yards, etc., and to be taken off when out on the road. The device is in use on several roads, and is said to have given great satisfaction.

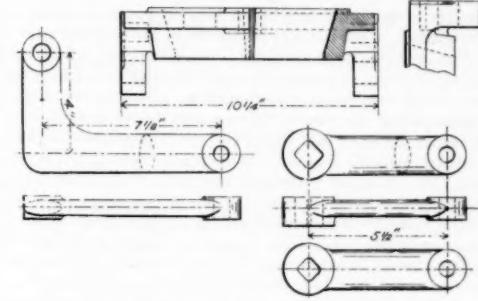
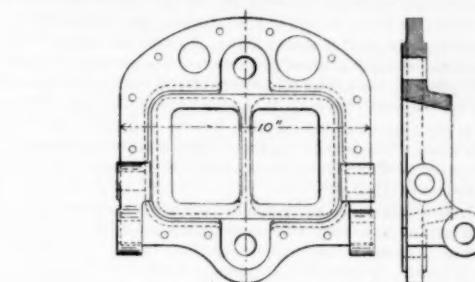
The muffler obviates very effectually the noise of the exhaust, in and about stations, and it is said to save coal and prevent tearing up the fire. It can be readily and cheaply applied. Further information may be had of the Pennsylvania Rolling Stock Improvement Co. (Limited), 1,418 South Penn square, Philadelphia.

#### Western Railway Club.—Anti-friction Metals and Steam Heating.

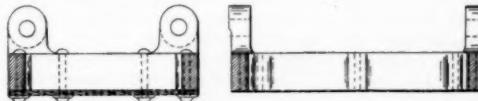
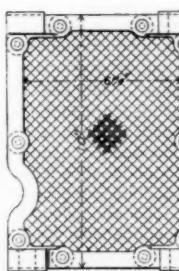
The January meeting of the Western Railway Club, in its new quarters in the Phoenix building, Chicago, last Tuesday, was a particularly lively one, and a good beginning for the new year. If this class of work is to be continued throughout the year, the labors of this club, at least, will be more valuable than ever before. The President opened the meeting with an earnest request to all members to take an active part in the discussion, and not to lead him to believe that they came there for the purpose of obtaining information, while being unwilling to give any, and he further stated that every man who carried away any data from that meeting, which was valuable to him, was morally bound to give something in return, either at that meeting or at a subsequent one. The extended discussions on the various topics go to show that his words were appreciated. These opening remarks seemed to give rise to a good fellowship in the subsequent discussion which was very pleasing.

The first paper read was one upon anti-friction metals, by Mr. Fred. F. Bennett, Western representative of the *Railroad Gazette*. This subject was originally allotted to a railroad man, of considerable experience with such metals; but he, being unable to prepare such a paper, owing to press of business, requested Mr. Bennett, who has been interested in this matter for some time past, to relieve him.

The discussion following the reading of this paper was quite prolonged. Mr. Seets (a manufacturer of car journal bearings) gave some very interesting facts in regard to the wearing qualities of various alloys, stating, as a conclusion, that he had found it necessary to use first-class materials only in making good journal brasses. Statistics were presented by Mr. Rhodes, Mr. Sargent, Mr. Higginson, Mr. Barr and others, with reference to the wear of journal brasses, in addition to those given in connection with the above mentioned paper. Although these results were not strictly corroborative, the one of the other, in all particulars, yet they seemed to show two things: First, that there was a marked decrease in the frictional resistances when hard bearings were used, and second, that it was quite necessary to look carefully after, not only the character of the ingredients before mixing, but the method of making the mixtures. An attempt was made to show that the softer bearings wore away faster than the harder bearings. This, however, was not successful, owing to the lack of concurrence of the data given. However, the results indicated



Exhaust Nozzle and Details of Connections.



Muffler.

that the lead, or softer bearings, wore the axles faster than the harder bearings. Mr. Barr and Mr. Townsend called attention to a very important factor in the case of the practical use of journal bearings, which is, that while it may be a fact, in a laboratory and in practical use, that the hard bearings give rise to materially less friction than the softer bearings—in some cases amounting to as much as 50 per cent. less, yet there is one requirement of railroad operation which demands attention, and that is that, regardless of the friction, and regardless of the wear, trains must be run on time. This necessitates that, whatever be the designs or materials of journal bearings, they must be such as to reduce, as far as possible, all heating of journals. In this connection, the unanimous voice of the meeting was that less heating resulted from the use of the soft bearings. And further, that, whereas in a new well-fitted truck, properly squared, hard journal bearings will run without danger of heating, and with less friction, yet in the case of old trucks, or trucks out of square, even when the journals are new and exact to size and shape, the hard bearings are liable to give trouble from heating; and this is much aggravated when the journals are old and irregular. This conclusion practically precludes the use of new hard bearings on the average journal in ordinary use in cases where heating must be avoided at any cost. The various causes which give rise to hot journals are about as follows:

a. Insufficient lubrication. This may be caused by several conditions: 1. A lack of oil in the oil box. 2. Lack of waste in the oil box. 3. Improper packing, even when the oil and waste are in sufficient quantities. 4. The use of an inferior quality of oil. 5. A lowering of the temperature, which solidifies the oil. 6. An increase of temperature, which reduces the body of the oil beyond a point where its consistency is sufficient to support the load upon the journal and permit the brass to run upon a film of oil.

b. Want of accuracy in the alignment of the brasses. This may result from various causes. 1. Improper location of the brass and wedge in the oil box. 2. Inaccurate placing of the oil box in the arch bars. 3. Want of proper alignment of the truck framing. The results from these causes are aggravated when the trucks are rigid. The more flexible trucks give rise to less twisting pressure on the journals from the foregoing causes.

c. Inefficient dust guards, which allow dust and grit to obtain access to the journals.

d. Collar friction, caused either by badly worn collars, ill-fitting brasses or heavy end pressure, which may result from various defects.

e. Flat wheels.

f. Hard spots in journal brasses.

g. Seams in the journals.

h. Too great pressure per square inch of bearing surface, resulting in inferior lubrication. On this point Mr. Rhodes fur-

nished some valuable information, stating that he had found it advisable never to allow the pressure per square inch of contact to be greater than 250 lbs., the area of contact to be reckoned as the horizontal projection of the journal. That is the area represented by the length of the journal multiplied by the diameter, the brass in every case being made to occupy a given degree of arc of the journal regardless of the diameter. This makes the brass bearing always fit against the axle with an area proportionate to the circumference or diameter of the journal.

I. Hot bearings sometimes result from the squeezing out of the inferior soft lining when such linings are used.

The question of hot boxes brought up by the discussion of this paper provoked more discussion than any other topic before the club for some time past. Attention was forcibly called to the necessity of keeping accurate record of the number of hot boxes in proportion to the amount of rolling stock in active operation. Although this is an old question, yet the discussion showed that but little attention was being paid to it. In regard to such records it was suggested that not only should a record be kept of the fact of the existence of hot boxes, but the causes should always be stated, in order that some remedy may be devised for the evil. The cause of heating is very difficult to determine, and there is but little time to make an investigation while the train is waiting for the box to cool off, but subsequent investigation will often reveal the general character of the defect which produced the heating. President Rhodes called attention to the fact that this subject of journal heating would be one which would be a topic for extended discussion at the coming meeting of the Master Car Builders' Association in June, and impressed the members of the club with the idea that the discussion at the present time was particularly valuable as a preparation therefor.

Two papers were read at this meeting upon the steam heating question. The first by Mr. Setchell, who represents the Martin system of steam heating, the second by Mr. Johnson, the inventor of the Johnson "Hermetic" Heater, and an electric temperature regulator. Mr. Setchell's paper was a strong argument in favor of using steam as a means of heating cars in the place of stoves. His intent seemed to be to impress his hearers with the absurdity of the notion that steam heating devices were impracticable, inoperative, and caused too strong demands upon the locomotive. His allusions to the steam air brake pump as an example of the demand which could be made upon a locomotive without interfering with its hauling capacity were forcibly drawn. This paper reiterates what we have stated in another column in regard to the effect upon the locomotive boiler of steam heating appliances in railroad trains.

Mr. Johnson's paper designed to show the essential elements of steam heating of railway trains, and while we disagree with the comparisons which he has made between house heating and car heating, and with his statement that overhead heating was essentially a success in buildings, we must agree with him in many other points. This paper we print at some length. The discussion following it was animated. The statement made by Mr. Johnson that patents relating simply to a system of piping were of no value excited considerable controversy from the other steam heating companies represented at the meeting.

Mr. Schroyer, of the Chicago & Northwestern, spoke at length upon the results of steam heating upon that road during the present season, giving in substance the statements made in the *Railroad Gazette* last week. The tone of this meeting with respect to steam heating was one of approval and the absurdity of discarding steam as a source of heat upon railroad trains, simply because the systems now in use are not automatic and as easily cared for as the ordinary stove, which has been part of the household equipment for years, was clearly shown. Those railroad men present at the meeting who had done little or nothing toward the development of steam as a source of heat, and had heretofore perhaps been a little skeptical, were unanimous in their desire to make trials of the various systems, and frankly expressed their disapproval of any attempt to deride the results thus far obtained from the actual use of steam heat in passenger cars.

#### ANTI-FRICTION METALS.

Following is an abstract of Mr. Bennett's paper: To avoid friction should be the tendency of the members of this club. That is what I am doing now in reading this paper. At our last meeting, at the instigation of one of our "most respected" members, I suggested to the President the subject upon which I am discoursing. My friend, "the respected member," was to have read the paper, but on being notified to prepare for the occasion, begged off with the excuse that his plan was to have the subject brought up some time in the future, dim and distant. But our Secretary did not so understand the situation; and to avoid friction between the President, the Secretary, the "respected member" and myself, I stand before you to-day. Should I rub too rudely against any pet theories, let me ask you individually to preserve your anti-frictional qualities, and not to get overheated.

It is not with the idea that I am to enlighten you a great deal that I have presented this paper, but in the belief that a systematic and thorough plan for testing bearing metals should be made by the members of this club, so that at some future time the question may again be taken up with profit to all. This will necessarily consume much time. The bronzes, of which there are various brands\* owing to their increased first cost and the expense of fitting them to the journal, ought to show more durability than the other metals, less first cost and less expense to fit up. I should say that the question of oils might be profitably taken up in this connection; it appears to be kindred to our present discussion.

The average railroad is to-day using a bearing metal composed of about 80 per cent. of lead and 20 per cent. of antimony. This, you will all admit, under the increased weight of

engines, increased speed and advent of the 60,000 lbs. freight car, will prove unsatisfactory.

The proposition as laid down before us is: "Can there be an anti-friction metal made for journal bearings to prevent heating under ordinary circumstances?" Basing opinion on the appended tests there can be but one conclusion, and that an affirmative one.

Unquestionably great progress has been made toward anti-friction metals, and yet how small a proportion of those having opportunities to investigate have given the subject the attention it deserves. This fact was forcibly impressed upon me while prosecuting a research after statistics upon which to base calculations at this time. I visited many railroad shops and saw personally many superintendents of motive power and master mechanics; but, strange to say, there was not one who was able to furnish me with the results of tests which would make a satisfactory hypothesis upon which to argue the present proposition. The evident carelessness with which the records had been kept, or the unsatisfactory conditions under which the trials were made, inclined one to believe that the tests were in some way deficient.

To one road, however, I am indebted for statistics where several metals were tested carefully. The oil was selected judiciously, the waste measured and the bearings placed upon locomotives diagonally; that is to say, one box on each side was equipped with company's standard metal, and one with a special metal. On some engines all eight wheels were equipped the same way. These statistics furnish quite as much material to puzzle one as to assist him in reaching any definite conclusion in regard to wear. For instance, one engine ran 11,048 miles where the average wear of the four boxes fitted with what shall be known as "A" metal was 10 $\frac{1}{4}$  ozs., or a little less than an ounce for each thousand miles. Another engine of the same class and in the same service ran 12,699 miles, or practically 1,600 miles further, with but 2 $\frac{1}{2}$  ozs. of wear, or an average of less than  $\frac{1}{4}$  of an ounce per 1,000 miles. The four wheels on each engine equipped with the standard metal also showed a vast difference in favor of the second engine, where the wear was but one-third as much. This fact might be accounted for by the point brought out by Mr. Johann at our last meeting with relation to the wear of tires, namely, that two engineers running the same class of engines in the same service might make a totally different record. Still, the difference is so great, that one cannot believe that it is entirely attributable to the care which the different engines received; especially, as both engines were handled from the same round house and the journal boxes on the trucks were looked after by the same men.

Another perplexing incident arises in the case where the standard metal, in running 11,048 miles, wore away 2 $\frac{1}{2}$  ozs. of metal, while in running 29,178 miles another engine of about the same weight used up only 3 $\frac{1}{2}$  ozs., or 93 $\frac{1}{2}$  per cent. more in traveling 2 $\frac{1}{2}$  times the distance. The conclusion was reached after these various trials that the metals thus tested did not possess anti-frictional qualities, and deciding not to adopt any of the brands tried, the road continued the use of its own standard. These tests were made some time ago. The road is now engaged in making tests of a metal recently brought to notice, and present indications point to a vast improvement on the record heretofore made on that road, if not the solution of the question under discussion. Suffice it to say, that the motive power department has frankly stated to me that this metal has shown itself to be more durable than their standard; and if some unexpected development does not present itself, it will approach near enough to the "anti-frictional" to warrant its extended use on that road. This metal is a composition, which, it is claimed, although as hard as the various makes of bronzes, does not possess the objectionable features of them, namely that the latter must be bored to fit an axle. The new metal may be molded without difficulty, inasmuch as its component parts combine mechanically as well as chemically, and harden uniformly. The great objection to many bearing metals is, that while they may be molded, in cooling there may be a little irregularity on the surface due to the fact that some of the ingredients cool more readily than others, and as consequence cut the journal. This, too, is a question which is not well enough understood.

In some shops where everything else is regulated according to the most improved and intelligent system, it is considered sufficient to make simply a chemical analysis as a test of bearing metals. It is well known that a chemical analysis of an alloy is but a small indication of its character as bearing metal.

The order in which metals are added to an alloy is a matter of great importance. Good results cannot be obtained by throwing in a crucible, without method, metals whose properties of assimilation are too far apart to combine satisfactorily. For example, to 10 parts of copper add respectively 90 parts of tin and 10 parts of antimony; now to 10 parts of copper add respectively 10 parts of antimony and 90 parts of tin; the two alloys, as shown in the ordinary chemical analysis, are the same; but as regards fusibility, tenacity, hardness, etc., they are widely different. The majority of alloys, so-called, manufactured for brasses and brass linings are nothing more than a mechanical mixture, very few brands being made upon principles of chemical combination. The result of this method of mixing metals is seen in a lack of tenacity and durability of most metals used.

In general, the question of first cost is the only one considered, the actual cost of a poor bearing hardly being taken into consideration. For instance, alloys composed of, say 80% lead, the specific gravity being from 10 to 11, would be an expensive metal to use as a bearing lining compared with a hard alloy of much less specific gravity, notwithstanding the first cost of the lead metal was only one-half the price of the harder alloy, which had 50% greater tenacity and durability, to say nothing of the cost of labor, loss of time, and the further fact that the harder metal would, without question, have the greater anti-frictional properties. On the other hand, many railroad men are insisting that a soft metal is preferable. Among the soft metal class may be mentioned what I shall term "C" metal and "X Y Z" metal. The test of X Y C metal (which test I may inform my bearers is semi-official, and from one of the leading members of the American Association of Railway Master Mechanics), was against a metal which I shall designate as "D" bronze. It showed a loss in 21,340 miles of 9 ozs., as against 1 lb. 7 oz for the bronze. On a total mileage of 43,010 miles the loss of four X Y Z bearings was 4 lbs. 12 oz., or an average

of 1 lb. 3 oz., as against a total loss of weight in eight bronze bearings of 10 lbs. 2 oz., or an average of 1 lb. 4 $\frac{1}{2}$  oz.

Aside from these tests of the railroads I submit for your inspection the tests of certain other metals made at the Ohio State University, showing quite wonderful results on the question of minimum friction. Of course, it must be borne in mind that these tests were made under the most favorable circumstances, the journal being well lubricated and the pressure thereon being about 2,000 lbs. Some of these metals which I have lettered show an average coefficient of friction of .0436. The ideas advanced in this discourse are not so much intended for the instruction of the Western Railway Club meeting as to provoke discussion. They are based upon only a superficial knowledge of the point at issue.

#### TESTS (Series A.)

	Loss in wt. oz.	Miles run.	Engine.
"A" metal	3 $\frac{1}{2}$ 7 $\frac{1}{2}$		
Average	5 $\frac{1}{2}$	11,244	127
Company's standard	3 2 $\frac{1}{4}$		
Average	2 $\frac{1}{2}$		
"A" metal	11 $\frac{1}{4}$ 13 $\frac{1}{2}$ 6 $\frac{1}{2}$ 11 $\frac{1}{4}$		
Average	10 $\frac{1}{4}$	11,048	137
Company's standard	8 6 $\frac{1}{2}$ 4 $\frac{1}{2}$ 7 $\frac{1}{2}$		
Average	6 $\frac{1}{2}$		
"A" metal	3 $\frac{1}{2}$ 2 $\frac{1}{4}$ 3 2		
Average	2 $\frac{1}{2}$	12,699	138 [Same class as 137]
Company's standard	3 $\frac{1}{4}$ 2 2 $\frac{1}{4}$ 1 $\frac{1}{2}$		
Average	2 $\frac{1}{2}$		
"B" metal	5 $\frac{1}{2}$ 2 $\frac{1}{4}$ 7 $\frac{1}{2}$ 8 $\frac{1}{2}$		
Average	6 $\frac{1}{2}$	35,587	
Company's standard	8 $\frac{1}{2}$ 7 $\frac{1}{2}$ 7 6		
Average	7 $\frac{1}{2}$		
NOTE.—"B" metal too expensive.			
"C" metal	7 $\frac{1}{2}$ 5 $\frac{1}{2}$ 5 $\frac{1}{2}$ 6 $\frac{1}{2}$		
Average	6 $\frac{1}{2}$	29,178	
Company's standard	11 $\frac{1}{4}$ 6 6 $\frac{1}{2}$ 14 $\frac{1}{2}$		
Average	9 $\frac{1}{2}$		

NOTE.—"A" metal "Pittsburgh" metal.  
"B" metal unknown.  
"C" metal "I. X. L." metal.

#### TESTS (SERIES B.)

Comparative statement showing wear of "X. Y. Z." journal bearings against phosphor bronze journal bearings.

Put under tender of locomotive No. 382, Oct. 22, 1883.

Record of lead lined placed on left side of tender, and numbered 1, 2, 3 and 4, beginning at forward end:

No. 1, put under Oct. 22, 1883,	weighed 12 lbs. 1 oz.
" 2 "	" 12 "
" 3 "	" 12 " 6 "
" 4 "	" 12 " 3 "

May 31, 1884, the engine having made 21,340 miles since, with corresponding numbers of lead lined bearings, were removed: No. 1, removed and weighed May 31, 1884, weight 11 lbs. 8 oz., having lost 9 oz.

No. 4, removed and weighed May 31, 1884, weight 11 lbs. 6 oz., having lost 13 oz.

No. 1, replaced where it was before, weight 11 lbs. 8 oz.  
" 4, " 11 " 6 "

July 22, 1884, the engine having made 24,970 miles since Oct. 22, 1883, with corresponding numbers of lead lined bearings removed and weighed.

No. 2 removed and weighed, weight 11 lbs. 5 ozs., having lost 11 ozs.

No. 3 removed and weighed, weight 11 lbs. 4 ozs., having lost 10 ozs.

No. 4 replaced where it was before, 11 lbs. 5 ozs.

No. 3 replaced where it was before, 11 lbs. 4 ozs.

Feb. 6, 1885, the engine having made 21,670 miles from May 31, 1884, removed and weighed, none of either kind worn out.

No. 1 removed, weighed and replaced, weight 11 lbs. 2 ozs., having lost since May 31, 1884, 6 ozs.

No. 4 removed, weighed and replaced, weight 10 lbs. 12 ozs., having lost since May 31, 1884, 10 ozs.

Feb. 6, 1885, the engine having made since July 22, 1884, 18,040 miles and weighed, none of either kind worn out.

No. 2 removed, weighed and replaced, weight 11 lbs., having lost since July 22, 1884, 5 ozs.

No. 3 removed, weighed and replaced, weight 11 lbs., having lost since July 22, 1884, 4 ozs.

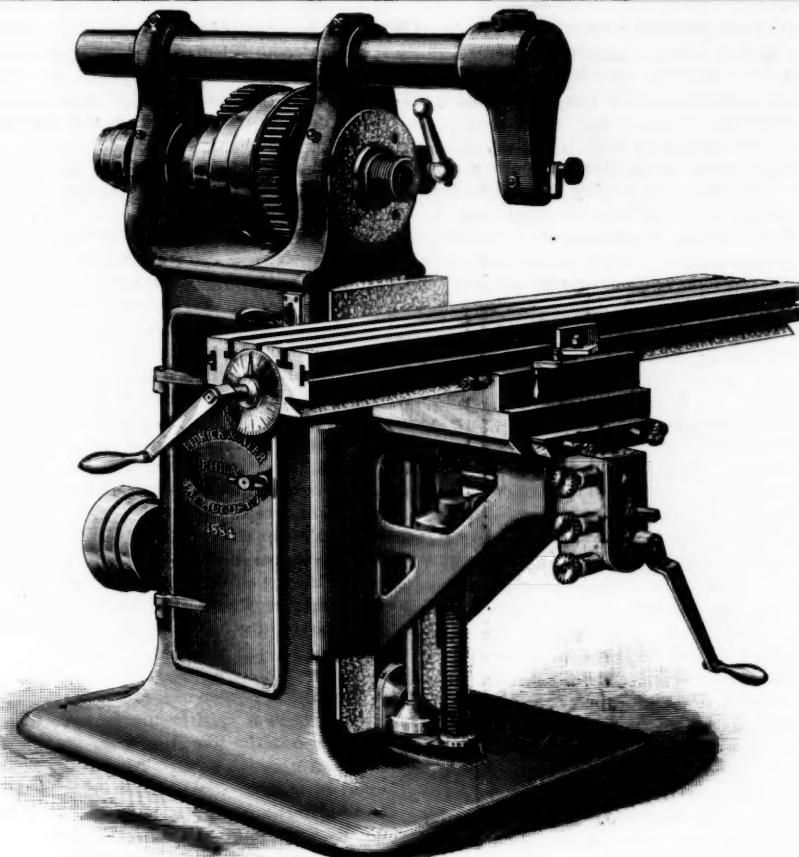
Record of "D" bronze placed on right side tender and numbered 1, 2, 3, and 4, beginning at forward end:

No. 1 put under Oct. 22, 1883,	weighed 10 lbs. 15 ozs.
" 2 "	" 10 " 9 "
" 3 "	" 10 " 2 "
" 4 "	" 10 " 11 "

#### TESTS—SERIES C.

NAME OF METALS TESTED.	Sperm oil.				Mineral oil.				Lard oil.			
	Feet trav'd.	Aver. fric'n.	Min. fric'n.	Raise in temp.	Feet trav'd.	Aver. fric'n.	Min. fric'n.	Raise in temp.	Feet trav'd.	Aver. fric'n.	Min. fric'n.	Raise in temp.
Randolph Metallic Co.	5,298	.0865	.0615	48°	6,532	.0786	.0690	78°	4,500	.1070	.0765	56°
Magnolia anti-friction metal.	14,143	.0750	.0570	90°	10,795	.0809	.0620	85°	12,428	.0679	.0455	88°
Illinois Alloy Co. "BB"	21,972	.0582	.0340	123°	11,801	.0436	.0305	82°	23,006	.0517	.0375	97°
Zero metal.	8,900	.0800	.0485	76°	10,867	.1003	.0785	93°	5,543	.0976	.0645	48°
P. S. Reeves' specially hard metal.	3,628	.0672	.0735	46°	16,148	.0686	.0465	88°	20,376	.0554	.0455	81°

\* The bronze referred to in the above are phosphor bronze, Damascus bronze, deoxidized bronze, Atlas bronze and Crown bronze.



UNIVERSAL MILLING MACHINE.

Made by MESSRS. PEDRICK &amp; AYER, Philadelphia, Pa.

October 22, 1883.—Nos. 1 and 4 bronze bearings being worn out they were weighed, showing as follows:

No. 1 worn out and removed May 31, 1884, weight 9 lbs. 8 ozs., having lost 1 lb. 7 ozs.

No. 4 worn out and removed May 31, 1884, weight 10 lbs. 8 ozs., having lost 1 lb. 11 ozs.

No. 1 replaced by new one May 31, 1884, weight 11 lbs. 8 ozs., " 4 " "

Nos. 2 and 3 bronze bearings being worn out, they were weighed with following result:

No. 2 worn out and removed, weight 9 lbs. 9 ozs., having lost 1 lb.

No. 3 worn out and removed, weight 8 lbs. 3 ozs., having lost 1 lb. 15 ozs.

No. 2 replaced by new one weighing 11 lbs., " 3 " "

Nos. 1 and 4 of each kind of bearings were:

No. 1 removed, weighed and replaced, weight 10 lbs., having lost since May 31, 1884, 1 lb. 8 ozs.

No. 4 removed, weighed and replaced, weight 10 lbs. 8 ozs., having lost since May 31, 1884, 14 ozs.

Nos. 2 and 3 of either kind of bearings were removed.

No. 2 removed, weighed and replaced, weight 10 lbs. 4 ozs., having lost since July 22, 1884, 12 ozs.

No. 3 removed, weighed and replaced, weight 10 lbs. 5 ozs., having lost since July 22, 1884, 15 ozs.

#### SUMMARY

of test to Feb. 6, 1885:

Total mileage made by engine from Oct. 22, 1883, to Feb. 6, 1885, 43,010 miles.

Loss of weight of 4 " X Y Z" bearings, 4 lbs. 12 ozs., " 8 bronze bearings, 10 lbs. 2 ozs.

" D" bronze is phosphor bronze.]

The Secretary read an invitation to the club to attend a social meeting of the Central Railway Club at the Tiff House, Buffalo, Jan. 23, and it was voted to return the thanks of the Association, and that the Secretary be instructed to get the names of as many members as would accept the invitation.

[The remaining papers and the discussion will be printed in a later issue.—EDITOR.]

#### Universal Milling Machine.

The milling machine shown in this issue is designed specially for heavy work, but it has great range, and is adapted for delicate and accurate work as well.

The principal dimensions are: Base, 40 x 30 in.; height of spindle from floor, 42 in.; length of platen, 48 in.; width of platen, 9 1/4 in.; length of slide-bearing for table, 13 3/4 in.; diameter of swivel base, 11 in.; vertical movement of knee, 15 in.; movement of slide on knee parallel with spindle, 7 3/4 in.; transverse movement of table, 33 1/4 in. The weight is 2,600 lbs. There are eight changes of speed and three of feed.

The gearing is made either internal or external as desired. The internal is four to one and the external eight to one. All running parts have oil tubes, and are accessible for oiling.

The spindle is of hammered cast steel and runs in bronze boxes. The front bearing is 3 in. in diameter and 4 1/4 in. long; back bearing 2 in. diameter and 4 in. long. The front end of the spindle is threaded on the outside for face plates or face mills. In the spindle is a taper hole for cutter arbors 1 1/2 in. diameter at the front end, diminishing 3/8 in. in 12 in., to 1 1/2 in. diameter, through which the arbors are driven out by a rammer. The bronze boxes have an adjustment by which the original centres are always retained without altering their position laterally—this is a very important point, as the journal and bearing wear always in the same place.

The cutter arbor supporting bar, with its adjustable centre, can be moved out to support the cutter arbors from the end of the spindle or pushed back out of the way, thus facilitating milling or boring a large piece of work that would be

prevented by the ordinary fixed bar. It is 3 1/4 in. diameter and of solid cast steel. A harness is furnished for the bar to fasten to the knee of machine when large cutters are used on extra heavy work.

The three feeds, vertical, horizontal (in line with spindle), and transverse (at right angles to spindle), are all reversible, and are operated or stopped altogether by the handle shown in the cut near the cup-board board. This reversing device, common to engine lathes, does away with crossing belts and aves time. The 3-step cone on the spindle belts to the lower one, the shaft of which runs in a hollow stud and drives, by means of the reversing device referred to above, a shaft running through the base of the column. Bevel gears connect this shaft with the vertical shaft, and the latter by bevel gears with the horizontal shaft in the knee, which communicates in turn with the several screws for the various feeds in the front of the knee by clutch gears. These clutch gears can be engaged or disengaged at will by the knurled knobs shown in front, giving vertical or horizontal feed. The platen feed is operated from the upper shaft in the knee by means of a pair of mitre wheels running in a bearing which is a part of the platen slide on the knee. A vertical stud passes upward to the long screw in the platen, and is connected to it by clutch mitre wheels. The screw in the platen is splined, and can be engaged and disengaged by a clutch lever, shown in the cut, convenient to the operator.

The platen is 48 in. long, 9 1/4 in. wide, and has two slots for 1/8-in. bolts on the top, and on the edges two slots. The latter are very useful and convenient. The platen has a transverse feed of 33 1/4 in. and a horizontal feed of 7 3/4 in. It can be turned completely around and fed in line with the spindle. It has an automatic stop, while feeding in either direction, and is secured by four 1/8-in. steel bolts in the swivel base, of easy access with a wrench. This machine is made by Messrs. Pedrick & Ayer, of Philadelphia, Pa., from whom you further information may be got.

#### THE SCRAP HEAP.

##### Notes.

The West Point Tunnel on the West Shore was reopened for traffic Jan. 13.

In the Michigan Legislature a bill has been introduced to repeal the law of 1887 prohibiting fires in passenger cars.

Gov. Hughes, of Arkansas, in his message to the Legislature, makes a strong recommendation for the establishment of a state railroad commission.

It is stated that one-half of the employés of the Philadelphia & Reading have now joined the Relief Association, making the membership 7,500.

The St. Louis, Arkansas & Texas has made a reduction of 10 per cent. in the salaries of its employés paid by the month receiving \$100 a month or more.

The Louisville, New Albany & Chicago has begun work on a large hospital at Crawfordsville, Ind. It is stated that employés will be assessed one per cent. of their wages for its maintenance.

General Manager Towne, of the Southern Pacific Co., after a conference with Chief Arthur, announces the settlement of the difficulty between the engineers and officers of the Atlantic System.

Harry D. Schall, Assistant Cashier of the Chicago & Northwestern at Chicago, has run away with about \$11,000, which was taken from the safe in the office on Saturday afternoon, Jan. 5.

There is a growing feeling among men in the train service that watch inspectors are given too much importance; that,

like spotters, they feel that they must make a record, and in so doing will make it burdensome on the trainmen in a financial way.—*Indianapolis Journal*.

Bills have been introduced in the Ohio Legislature to limit passenger fares to 2 cents a mile, to compel the heating of passenger cars by steam and requiring all freight cars to have automatic couplers. Similar 2-cent fare bills have been introduced in Illinois and Michigan.

The New Hampshire Railroad Commissioners have investigated the late disaster at Hooksett, where a bridge undergoing repairs was carried off its foundation by a flood, killing three men. They say that it was an error of judgment to move a car, which lessened the weight upon the bridge, thus allowing the great volume of water to lift the horses supporting the bridge, but they attach no blame to any one.

It is stated that the roads centring in Cleveland which require watch examination (New York, Pennsylvania & Ohio, Cleveland & Pittsburgh, Cleveland, Columbus, Cincinnati & Indianapolis Valley, and New York, Chicago & St. Louis) have had about 2,000 watches examined, of which 30 per cent. were rejected. Four-fifths of the watches carried by trainmen are open face. The two roads last named require the anti-magnetic shields. It is stated that the Lake Shore & Michigan Southern will soon require inspection.

In the storm of last week the tracks of the Lake Shore & Michigan Southern were flooded by the waters of Lake Erie for some distance a few miles west of Buffalo. The tracks are about 3 ft. above ordinary lake level, but about 2 miles of the north main track was badly washed. The telegraph lines were all down. The damage by the storm in Buffalo has been estimated at \$250,000, the heaviest loss being the New York Central & Hudson River Railroad, whose tracks between Buffalo and Niagara Falls were badly washed. Over 100 cars loaded with grain and other freight were flooded.

#### Collision at Tallmadge, O.

A very bad butting collision occurred on the New York, Pennsylvania & Ohio, two miles east of Tallmadge, at about 2 a. m., Jan. 14. The second section of a west-bound freight, No. 81, broke in two, and the engineer hauled the forward portion to Tallmadge and placed it upon the side track. He then left his fireman there to stop passenger train No. 8, due from the west, and returned for the rear portion of his train. On reaching it he called in the flagman from the east and prepared to start for Tallmadge. The fireman, on hearing the whistle signal, understood it to be meant for himself, and at once started for his own train, but before he reached it the passenger train came on at high speed and dashed into the freight, with little or no warning, the track being on a curve. There was a dense fog at the time. The engineer and fireman of the express, an express messenger, freight brakeman & 4 passengers were killed, and 4 passengers and 2 trainmen injured. The wreck of the engines was complete and the first three cars of the passenger train were telescoped into the length of one. The wreck took fire and six of the dead were burned up.

#### New Shops.

The Union Pacific has made arrangements with the city of Cheyenne, Wyo., under which it will construct at that point general shops which will give employment to about 1,000 men. The city is to furnish the road with free water, build two viaducts and one bridge over the line within the city limits, one of the former to be completed prior to Jan. 1, 1891. The city gives a right of way through a number of streets and alleys in the suburbs. Work on the shops will commence at once.

The Evansville & Richmond last week purchased ten acres of land adjoining Columbus, Ind., for the purpose of erecting the company's shops at that point.

Superintendent Theodore D. Kline, of the Mexican National, has appointed Mr. C. M. Tilley Superintendent of Construction of the Machine Shops at Laredo, Tex. Excavations for laying the foundation have been commenced, and they will cover about 20 acres of land, and when completed will cost nearly \$600,000.

#### TECHNICAL.

##### Black's Block Signal.

The Brooklyn Bridge Railroad has ordered two of the automatic mechanical block signals invented by Robert Black, Road Master of the Manhattan Elevated. This signal consists of a disk fixed upon an upright iron rod similar to the target of a common switch. This rod is connected with a track instrument, by means of which the wheels of a passing train set the disk at right angles with the track (danger). The rod is also connected, by means of a gas pipe connection along the sleepers, with a track instrument several rods in advance of the signal. A train on passing this point turns the signal back to the position in which the disk is parallel with the track, showing all clear. The device has been used for some time on the New York Elevated and on the Staten Island Rapid Transit roads.

##### Wreck of the Niagara Highway Suspension Bridge.

This structure, which spans the Niagara River just below the falls, was partially wrecked by the wind on the morning of Jan. 10. The wind is said to have been blowing 74 miles an hour at the time. The towers, anchorages and cables are said to be intact, the guys, suspenders, trusses and floor system having been destroyed. The loss is estimated at \$50,000, and it is probable that the bridge will be at once repaired. The original wooden towers of this structure were replaced by steel in 1884, and last year much of the bridge was renewed and the roadways widened. The first suspension bridge across the Niagara River was wrecked by the wind over 30 years ago or more and never rebuilt. The cables hung in place a few years ago and may still be hanging.

##### Electric Roads.

The Thomson-Houston Electric Co. is to equip a part of the McGavock & Mt. Vernon Street Railroad of Nashville, Tenn. The contract covers two miles of double track and one mile of single. The maximum grade is 5 1/2 per cent. There are to be six 16 ft. cars equipped with two 10 h. p. motors. The electric cars are to make in 30 minutes a trip which now consumes 70 minutes.

This company is to equip two miles of road at Southington, Conn. The overhead system is used at both places.

On the seven-mile line of the West End road, from Bowdoin square, Boston, to Arlington, Mass., the Thomson-Houston Co. has now nearly three miles (double track) equipped, and work is in progress on the remainder. The poles on this line are made of iron pipe, about 100 to the mile. They are set in crushed rock and cement. There were a number of peculiar problems in the construction of this line, a drawbridge and a railroad crossing, at which were gates, having to be provided for. Twenty of the present horse cars are to be equipped with the electrical apparatus. Each car has sufficient power to propel one besides itself. All of them are to be lighted with electric lights and furnished with head-lights.



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#### EDITORIAL ANNOUNCEMENTS.

**Contributions.**—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

**Advertisements.**—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN OPINIONS, and those only, and in our news columns present ONLY SUCH MATTER AS WE CONSIDER INTERESTING, AND IMPORTANT TO OUR READERS. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them EDITORIALLY, either for money or in consideration of advertising patronage.*

There is nothing like experience to settle such complicated questions as the action of entirely new devices in actual railroad service. Thus we find that the Master Car Builders' coupler has actually increased the number of accidents to trainmen, of one kind. This has resulted from the increased distance between cars when the automatic coupler is coupled with the link to the ordinary draw head. This increase of distance between cars is seven inches when the Master Car Builders' standard coupler is connected with the Potter drawbar. Trainmen, running over a train in the dark, miss their footing by reason of this increased spacing of cars, and several serious accidents have happened lately for this reason. It is difficult to offer any remedy except that one which we have so frequently suggested for the removal of accidents from other causes, and that is the complete and uniform adoption of the Master Car Builders' couplers for all cars. When this is done, then many of the difficulties experienced with the ordinary couplers, during the transition stage, will be removed.

"Mistakes in giving or understanding orders" are responsible for a good many collisions in the course of a year, and for some of the worst ones. A large portion of these are never explained in print. They involve freight oftener than passenger trains, and a large majority occur in states where there is no efficient railroad commission. The reporters of the daily press do pretty good work in many localities, but competent men are few compared to the field to be covered. But of course the particulars of these collisions ought to be published. With the thousands of miles of single track operated in this country every superintendent should be fully informed of all the pitfalls necessary to be guarded against.

The collision between a Chicago, Rock Island & Pacific vestibuled train and a passenger train of the Denver & Rio Grande, on the track of the latter, Nov. 26, well-known to our readers, was reported as being caused by an operator's failure to deliver an order. How or why he failed was not published, and information on this point was apparently beyond the power or skill of the authorities to elicit; but a very simple and apparently authentic explanation has just reached us, and we give it to our readers. Superintendents whose faith in their men and in the best of systems has been shaken by reports of forgetfulness can take note. The duplicate order system was in use and the rules were all right and understood, but the operator transmitted the signature of the conductor before the conductor arrived, and the dispatcher gave him "complete" for the order. The operator then forgot to carry out his intention of delivering the order and getting the signature on delivery. Whether the station signal was left at "all clear," or the failure was a result of delivering only one order when two were in hand, does

not appear; but looseness with the station signal is no more than could be expected where forgery of signatures is tolerated. The important point to be remembered is, that this trick can be so readily detected. A systematic comparison of the times at which signatures are received by the dispatcher, with the times of trains on the train sheets should very soon expose it; and we can very readily believe the further statement that this sort of recklessness is common and that the dispatchers are cognizant of it. The theory that all negligence which causes serious disaster will always be found to have been more or less habitual is still worthy of respect.

Highway crossing gates are briefly discussed in a communication on another page. An ideal man would, no doubt, be as good as a gate, or better. With an alert eye and wielding a bright flag he could make a 24-in. arm as effective as a 24-ft. gate. General Sheridan tells how Prince Bismarck, when driving in a crowded and obstructed street, got out of his carriage and cleared the road of vehicles in a jiffy; but that was Bismarck; and besides, he had a pistol in his hand. Bismarcks cannot be had for \$1.25 a day. The average flagman has not the impressive bearing necessary to infuse the requisite disposition to "Look out for the engine while the bell rings," into the average horse, much less into the average driver, who is in a hurry and disposed to take risks for the sake of saving a few seconds. A very ordinary kind of flagman could, indeed, give such drivers fair warning, and thus throw the real blame, in case of accident, upon the one whom it belonged; but when a rear carriage wheel gets scratched and the occupant sues the railroad for \$5,000, afterward lying about the warning, claiming perhaps that he had none at all, the beauty of this plan vanishes. For this reason and for the reason that railroad custom in general favors machine methods—a dollar man with a machine rather than a two dollar man without, even if both systems were equally cheap and efficient—most managers will probably continue to prefer the gate. If a careless driver or a scared horse disregards a gate the breakage of the barrier is incontestable evidence of the fact. Elevated lookouts for gate-tenders are a great improvement on the common kind, whether the man is allowed to entertain company or not. With a gate, the most that the attendant can do, outside of turning the cranks, is to shout at careless persons; and this he can do from a second-story window as well as if on the ground floor. The prohibition of visitors is an exceedingly difficult thing to adjust. In summer the gateman can converse with the loungers outside, even if he be 10 ft. above them. In winter, by a hot fire, falling asleep while reading might be as easy as withdrawing attention from duty while playing a game of cards. A man too dull to read or to desire company would generally be too dull for usefulness of any kind in such a place.

There is a demand for something better in freight car construction, and many of those who are looking for improvement are inclining towards a metal car. The cause of this is not an admitted impossibility of so constructing a wooden car that it will meet the requirements of freight service, but it is a fact that many freight cars now made do not meet such requirements. It cannot be disputed that much of the workmanship of freight cars lately put into service is very inferior. We have recently examined a lot of 50,000 lb. freight cars which were turned out by an establishment which has a very large business and a fair reputation. These cars showed workmanship careless in many details, if not actually reckless. The following were some of the noticeable defects. The posts and struts in the side trusses did not bear against the sills within  $\frac{1}{2}$  in. The fitting was not square or parallel. Parts which were intended to carry heavy loads were not home against the seats where they were intended to bear. The door battens were put on in a careless manner, being out of square with the door, the ends having been cut off with a hatchet instead of a saw. Nearly every nail had split the soft pine boards, some of the splits being 12 in. long, and  $\frac{1}{2}$  in. open. The interior finishing was inferior in almost every respect: a lack of neatness was shown throughout the car, the doors would not slide and would have to be "eased up" before they could be used. It is such construction as this that sets people to thinking of metal cars. The fault is not, however, entirely with the car works, so long as the railroad companies will order and receive freight cars without proper inspection. Surely no inspector, who had any knowledge whatever of his business, would have received and passed the cars in the lot mentioned. Freight car construction

is mostly what is known as contract work, and a contractor is compelled to meet the requirements of the works' inspector and the railroad inspector. When it happens that he has been hard pressed to make both ends meet while filling the requirements of a sharp and intelligent railroad inspector, his human nature prompts him to make it up on the first batch of cars allotted to him, of which the inspection is not so sharp. No one knows better just how each detail of an ideal car should be constructed than the car makers and their sub-contractors. They have a constant schooling in the best freight car construction while manufacturing for those railroad companies which insist upon getting a fair return for their money. It is, therefore, not because of lack of knowledge on the part of the car companies that inferior cars are placed in service, but for other reasons, one of which is the desire to make as much money as possible on each order, and another probably the necessity of competing with other car manufacturing companies, who either have better facilities, or are compelled, in order to keep their works in operation, to take orders at a low figure. If it is the low prices which compel the car-builders to turn out inferior work, then the railroads are to blame that they do not hold the standard higher, demand better work and pay for it.

The Webb compound locomotive for the Pennsylvania will soon be running in service. It is in all respects exactly like the compounds used on the London & Northwestern for hauling their principal express trains. The tender is not of the regular London & Northwestern pattern, but is very similar and is fairly representative of ordinary English practice. The application of the compound principle to locomotives has been much discussed in England, and the opponents of the system have mainly urged three reasons against compounding locomotives: 1, that English locomotives have already attained the lowest possible limit of coal consumption per unit of work performed; 2, that the compound principle is inapplicable to non-condensing engines; and 3, that it is likewise inapplicable to engines working at varying speeds and under widely different grades of expansion. The advocates of compounding reply as regards the first argument, that in nearly all cases compound engines have shown a considerable economy over locomotives of similar pattern but non compound, when both have worked under similar conditions, and that even the opponents of compounding cannot quote a case in which the compound has burnt more fuel than the ordinary engine when tried on the same service.

As regards the second argument it is pointed out that the majority of portable engines above 10 nominal horse-power are now made compound, though non-condensing, and that the range of pressure in a compound locomotive is greater than in the majority of compound condensing marine engines now running. For instance, a compound locomotive with only 160 lbs. boiler pressure, has a range of 155 lbs., allowing 5 lbs. back pressure, while a modern steamship like the Alaska has a range of only 112 lbs., allowing nearly 3 lbs. back pressure, the boiler pressure being 100 lbs. Now, it is admitted that above this pressure a triple expansion engine gives the best results, the range of pressure being too great for an ordinary compound. Hence the range of pressure in a locomotive should be ample for compounding.

As regards the third reason against compounding locomotives, the advocate of the system must admit that practical difficulties exist, but contends that any loss from over-expansion when the engine is running under a high degree of expansion on the level or down grade, is more than counterbalanced by the great saving effected when the locomotive is working hard, toiling up a grade or starting a heavy train. An ordinary locomotive is then working with little or no expansion, while a compound is working with three-fold expansion when exerting the same tractive force. The compound locomotive cuts off late in the stroke in the high-pressure cylinder, but the steam expands in the low pressure cylinder, and, as generally proportioned, the total expansion is never much less than three-fold. It is urged, and with reason, that while the difference between five-fold expansion in the ordinary locomotive and seven or eight-fold in the compound, does not materially affect the consumption of coal, the difference between cutting off at the end of the stroke and expanding three-fold is enormous, and that it is when exerting full power that the economy of the compound locomotive is manifest. Doubtless the present styles of compound locomotives are susceptible of improvement. The proper proportion of the cylinders, valves and valve gear are all difficult problems, which experience and ingenuity alone can

solve, and help to make the success of the compound locomotive as undoubted as that of the compound marine engine.

The meeting of bankers and railroad presidents last week has resulted in a definite and formal agreement. It differs from previous associations in the fact that bankers as well as railroad officials are actively interested in the movement. It thus represents to some extent railroad owners as well as railroad managers. Independently of the actual results reached in any particular case, this is a most healthful sign. The more railroad investors look after their property the better that property will be managed. The more bankers see the real difficulties of railroad management and understand the sources of loss, the less likely will they be to engage rashly in parallel railroad building. The effect will thus be good on both sides. We welcome the movement, more because it indicates the growth of this spirit of co-operation, than because there is anything new or startling in the machinery proposed. In spite of all that is said about it, this agreement is very much like other agreements. The methods for enforcing it are not radically different from those which have been tried with varying success in times past. There are somewhat stricter pledges to bring disobedient subordinates to punishment. These, as far as they can be carried out, will be of service. There is greater assurance that the support of the stockholders will be given to the conservative manager rather than to the reckless one, and this puts conservatism at a premium and recklessness at a discount. How far these pledges can be fulfilled remains to be seen. If one or two roads are managed in defiance of this contract it may be extremely difficult to bring them before the bar of justice. If it can be done, there will have been a distinct advance; if it cannot, we shall probably see a relapse into the old order of things. The latter alternative is so undesirable that we hope that every effort will be made to give the new experiment a fair trial.

As between the three plans for regulation of competitive traffic, which we suggested in our last issue, the new association has rejected attempts at clearing houses or consolidation, and adopted a resolution looking strongly in the direction of a pool. This resolution, which is concealed in a somewhat obscure place near the close of the agreement, reads as follows: "The Executive Board shall from time to time take such steps as may be proper, requisite, and legal to secure to each company its due share of the competitive traffic." Obviously this is of the very highest importance. If it is found, in conference with the Commissioners, that this can be carried out, it will result in a virtual evasion of the evil effects of the pooling clause of the Inter-state Commerce Act. If this could be accomplished without violation of the law, we believe that it would be worth more than everything else put together to modify some of the evils under which we are at present suffering. If, on the other hand, the Commission is not disposed to admit the lawfulness of any such division of competitive traffic as is here contemplated, the agreement, as a whole, will have much less strength. But in either alternative there will be something to be thankful for. If a modified form of pooling is practically allowed, it will be a positive gain. If it is not allowed, we shall have a direct opportunity of testing the question whether, without pooling, an agreement supported by the strongest names in the financial and railroad world alike and entered into with good faith by the representatives of the leading systems of the country, can meet the difficulties and demands of the case.

#### Government Railroad Statistics.

The second annual report of the Inter-state Commerce Commission, as now published in its complete form, contains, in addition to the report itself, a long and somewhat important series of appendices. In the first of these there is printed a full copy of the Act to regulate Commerce with similar laws of Canada and of England. The English digest is specially good and well arranged. A second appendix contains a statement of points decided by the Commission, which will be of great service to those who do not subscribe to the full reports but who wish to have a ready means of finding what has been actually settled. An excellent index greatly helps in making this serviceable. Further appendices contain a summary of work done and cases decided, also an account of the organization of the Commission, the number of employees and the salaries paid.

More than a hundred pages are devoted to the work of the statistical department. The form of report prescribed is not merely given in detail, but illustrated by the actual returns of the Northern Pacific itself.

The instructions for the guidance of carriers, to which we made allusion at the time of their original issue, are appended in full; while the report of the Commission itself contains some valuable, though not specially new, comments on this part of the subject. The general report of the statistician—Prof. Henry C. Adams—is not yet published, owing to delay in receiving and tabulating the vast system of returns required, but a preliminary report is given which will be read with some interest. This report deals, in the first place, with the relation of railroad statistics to questions of public economy; second, with their bearing upon technical questions of railroad management; and third, with their more especial bearing on those problems handled by the Inter-state Commerce Commission itself. Prof. Adams believes that the possession of more complete and trustworthy statistics would make it possible to check the violent fluctuations between railroad inflation on the one hand and commercial crises on the other. He believes that it would furnish a basis for the study of the conditions which govern the development of different parts of the country. Above all, he is confident that it would help to bring the controversies between railroad managers and shippers to a basis on which they are susceptible of a calmer discussion. He holds that government statistics will furnish more reliable data for making and for discussing tariff schedules; and that the commission acting on ground thus furnished will be able to do justice to the railroads and at the same time to justify its work to the country as a whole.

Of the importance and practicability of this work, Prof. Adams, as is perhaps natural, has a surer confidence than the Commission itself. Take, for instance, the historical investigation into the cost and value of our railroads. As is well known, it has been in some cases impossible to furnish satisfactory returns on these points, even with the best will in the world. The Commission itself admits the difficulty. It says that the subject is recognized as an exceedingly important one, but it believes that it can only be handled gradually and in detail. The interrogatories with regard to the history, which were prepared in accordance with the requirements of Section 20 of the Act, "are of value as affording a basis for such future investigation as may be found desirable and necessary." So of the other inquiries with regard to cost and value, "the difficulties surrounding this question are so great that while the Commission has endeavored to the best of its ability to comply with the provision of the law in question, it will be found impossible to establish any safe basis of determining the result desired from any data which it has as yet been able to secure." On the other hand, Mr. Adams believes that Congress intended that such an investigation should be made, and that it is the duty of the office to make it. If for any such inquiry it is necessary that the corporate history of the railroads of the United States must be written, he believes it the duty of the office to undertake this work also, and urges the Commission to sanction such an investigation.

We have grave doubts whether anything of the kind will be done or ought to be done, until material now on hand is more thoroughly mastered. When the form of report which has been adopted was first proposed, we said that it was too long and complicated. We still think so, and we believe that the results show it. Although the railroads have had six months in which to make their returns, only a part of them have been able to furnish the necessary information. Though a separate bureau of statistics has been established in the office of the Commission and placed in the charge of a specialist, he has not been able to adjust even that part of the matter which he had in hand. The summary of railroad mileage on page 251 is full of grave errors. The lines are credited to the states whence their reports come, rather than to the states where they are actually located. In some instances the difference is not very great, in others it is overwhelming. About half of the railroads of Iowa are credited to Illinois, so that the former state appears as having less than 3,500 miles of railroad and the latter more than 16,000. The territorial mileage is in almost every case returned as much too small, because the companies which have built into the territories report from central offices further East. For instance, Idaho, with more than 845 miles of line, is credited with only 634. This error makes the tables of relation between mileage and area simply useless: less valuable, in fact, than those of Poor's Manual, although arranged in some respects on a better principle.

Now is the table of railroad capital satisfactory: 120,000 miles of line are represented, having an out-

standing capital of \$6,976,000,000; of this total, \$919,000,000 takes the form of common stock, \$472,000,000 of preferred stock, \$3,385,000,000 of funded debt; all of which is presumably right enough. But when we come to the statement of unfunded debt we find only \$201,000,000. This last figure is surprisingly small; the more so, since it is explicitly stated to include floating debt *plus* current liabilities. It is a pretty well known fact that the floating debt and the current liabilities of the railroads of the United States taken together amount to something like 5 or 6 per cent. of railroad capital, instead of being as here given, less than 3 per cent. Perhaps there is something in the way in which the table is made up to explain this difference; but we are given no hint of what it is. The deduction of contingent liabilities from the list would hardly be enough to account for it. It is possible that the current liabilities as given may be of the nature of a current liability *balance*: deducting, that is to say, from "Bills Payable" the amount of "Bills Receivable." But this would be an unusual and hardly warrantable method of arranging accounts.

The whole subject of floating debt is treated in a somewhat unsatisfactory fashion by the statistician. He says explicitly that this is the form in which railroad circulating capital exists, and that it is the measure of the amount employed. We imagine that few railroad officers would be ready to accept that statement. Sometimes it may be true, sometimes it certainly is not. If a railroad is engaging in new construction and meeting the expenditures by notes, pending an issue of bonds, the result appears as floating debt, but it most clearly represents fixed capital. If, on the other hand, railroad finds itself in such easy circumstances financially that it prefers to hold a cash reserve and pay its bills just as fast as it can, the floating indebtedness at any time will appear relatively small: but the amount of circulating capital required will actually be quite as large under this system as under any other. Above all, if the account of floating indebtedness is to be of the nature of a balance of assets and liabilities, the attempt to use it as a measure of circulating capital engaged in railroad undertakings is of questionable value.

The summary of earnings and income contains nothing except what we have had on a larger and more complete scale in recent issues of Poor's Manual. The summary of expenditures, on the other hand, is something new and important. We give the figures in full:

SUMMARY OF EXPENDITURES.  
[120,000 Miles of Line Represented.]

Source of expenditure.	Amount.	Proportion to operating expenses.....	Proportion to total expenditures.....	Proportion assignable to—	
				Passenger service	Freight service
Maintenance of way and structures.....	\$116,199,339	22.88	15.76	Per cent. 36.14	Per cent. 63.86
Maintenance of equipment.....	87,808,398	17.29	11.92	29.98	70.02
Conducting transportation.....	249,728,964	49.18	33.88	31.87	68.13
General operating expenses.....	54,039,914	10.55	7.33	38.86	61.14
Total operating expenses.....	507,796,345	100	.....	*34.21	*65.79
Fixed charges.....	229,338,165	.....	31.11	.....	.....
Total expenditures(excluding betterments).....	737,134,510	.....	100	.....	.....

\*Approximate figures.

Apart from the somewhat doubtful question of proportions assignable to freight and passenger service (the difficulties of which Professor Adams recognizes to the fullest extent), this represents an actual positive gain in the matter of information, and comparative results for successive years cannot fail to throw great light on vexed questions of economy and finance. This part of the work promises to be extremely well done. We are glad to quote what the statistician says on the subject.

"There is, of course, some danger of misinterpreting, or rather misapplying, such figures as the above summary will lead to when presented. They are to be accepted as averages and not as a standard. It lies in the theory of averages to eliminate everything that is peculiar. He, therefore, who makes use of an average for any particular problem must modify the standard so far as that is necessary to allow for what is peculiar in the conditions considered. So far as the above deductions are concerned, it is quite likely that the United States is too vast in extent, and presents too great variety in the conditions under which railway traffic is carried on to admit of a defensible standard for the entire country. It is likely

that it will be found necessary to group the railways according to some plan that will give general conformity and fixed items of cost and expense for each group. It will be seen that the problem setting forth trustworthy statistics is not a light one."

We only wish that he understood with equal clearness some of the difficulties which beset the railroads in making out the returns. When we find, two pages later, that "the meaning of permanent improvements is sufficiently clear," we can only say that if it were, one of the chief reasons for collecting railroad statistics would be done away with. In fact, the difficulty of deciding what are permanent improvements and what are not has been, in some respects, the most perplexing problem with which railroad officials or railroad directors have to deal. Nor do we know of any man of long experience in the subject who would not regard it as a matter of the most serious difficulty to decide it properly and correctly. We hope that as these government statistics are developed we shall have a basis for a closer approximation in the future than we have had in the past, but before they can be of any service they will have to be much more fully digested and carefully studied than is the case with those which have been presented in the preliminary report before us.

#### Steam Heating in Michigan.

A bill has been introduced in the Michigan Senate for the repeal of the act of 1887, which provides that, after Nov. 1, 1888, every railroad company shall make effective provision against burning up passenger cars. All the trunk lines and nearly every railroad company in the state have signed a memorial declaring that the act is impracticable and unnecessary. The only way it can be complied with, they say, is to absolutely abolish stoves and all other appliances for heating cars. It is impracticable, they further say, because long trains on heavy grades and frosty tracks cannot make time if steam heat is used; and this, they claim, is more dangerous than fuel on account of the danger of scalding. The Commissioner of Railroads of the state of Michigan further states that, after examining the subject carefully, he is unable to find any system of heating that he will approve that will comply with the law and yet be effective to keep passengers comfortable and enable trains to make time.

If the foregoing statements and findings were true, then we might readily conclude that the labors of all steam heating companies, thus far, have been in vain. That such is not the case can be readily seen by even a cursory examination of the results of steam heating on the various roads during the winters of 1886 and 1887, and the present winter thus far. We do not mean to say that steam heating has arrived at a stage where it can be considered as a problem solved, or that the question is practically settled in all its details, but we do say that where any railroad company honestly and earnestly takes up the question of steam heating it will be enabled to select more than one system which will properly heat the cars, produce no detrimental effect on the engine and reduce the liability to accidents resulting from fire, in the case of a wreck, to a minimum, and that we believe to be the spirit of the Michigan law. The law requires that railroads shall make effective provision against the burning of passenger cars. Surely by no possibility can steam heat set fire to a car.

In regard to scalding the passengers; in the case of a serious wreck, there is little doubt that the piping would break in more than one or two places, and the chances are against this happening in the vicinity of the body of a passenger who might be entangled. The volume of steam, in the steam heating pipes of a car, is very small, and this small volume would soon escape into the atmosphere, thus leaving all parts of the wreck accessible to outsiders. We made a note last week of a trial made before the Massachusetts Railroad Commission to determine this very point. It was found that even with steam escaping into a car at a pressure of 80 pounds, no serious effects would have been felt, except by a person very close to the point of escape. In the case of hot water heating there is far more danger of scalding, but even this, in its worst form, does not compare with the danger of a wreck on fire.

To explicitly state the effect of steam heating on the locomotives, we will say that, thus far, in the coldest weather, the maximum amount of condensation per car per minute has been found to be about one pint. A pint of water weighs about one pound. A pint of water per minute per car in large trains (baggage cars do not yield as much) about 8 lbs. per minute. A locomotive will evaporate for each pound of fuel consumed from 5 to 7 pounds of water. At the most a consumption of 1½ lbs. of coal per minute in the loco-

motive fire-box would furnish the necessary steam to heat a large train. One square foot of a locomotive grate will consume from 60 to 100 lbs. of fuel per hour, and there is no doubt that when the engine is being worked hard, and has plenty of draught, such as it would have in the case cited in the bill of the Michigan Senate, 1½ sq. ft. of grate of a locomotive would evaporate all the water necessary to heat the cars. A common locomotive such as is used to haul heavy trains has about 20 sq. ft. of grate surface. It will therefore require about 6 per cent. of the steam capacity of the locomotive to heat the train. There are to-day but few locomotives in operation which really lack steam when the fires are properly handled. Any locomotive whatsoever, if improperly fired, will steam insufficiently on long grades, and nearly all locomotives when properly handled will have plenty of steam even on considerable grades, but the time for passing long grades is not great, and if the steam were partially shut off from the train during a portion of the run on the grade no discomfort would be felt by the passengers; in fact no change would be perceptible. The statement of any railroad company to the effect that its locomotives will not meet an increased demand of 6 per cent. on their boilers is equivalent to an admission that that road either has an inferior equipment, is employing a low grade of firemen or an inefficient traveling engineer. We know of one road where steam heating has been long and extensively used, on which it has been found that the effect of this extra use of the steam is inappreciable, either in the fuel bills or in the performance of the engines. This is the net result of an experience of three years in a cold climate.

The loss of power on a frosty rail is made one of the reasons why steam cannot be spared for car heating. The fact is that any decrease in the coefficient of friction between the wheels and the rails merely decreases the amount of pulling capacity of the locomotive, but does not interfere with the steam supply. The loss of steam due to slipping of the drivers is small compared to the total amount used for pulling the trains, and the reason heavy trains cannot be hauled in slippery weather is not for lack of steam, but on account of the decrease of adhesion.

A reason not given by the Michigan companies, but considerably more potent than either of those which we have touched on above, is doubtless the expense. In adopting a continuous heating system they consider the first cost; the increased cost of attendance, and the expense resulting from the necessity of educating the trainmen; and still further the necessity of employing some person or persons to make a specialty of steam heating on their lines. It is, however, frequently stated by those companies which have had most experience with steam heating that there is an actual economy in all the items except that of first cost; but even were the expense greater than with independent heaters we should hardly expect to get at first a superior service without an increase in expense.

The public demands, as a safeguard, some better method of heating cars, and fully appreciates that the safest method now before us for heating cars is by use of steam, and it is impolitic, to say the least, for the railroad companies to put off the public demand on grounds so slight as those taken in this Michigan incident.

"Resist the devil and he will flee from you" is the "clarion note" adopted for the text of a vigorous sermon on the evils of ticket scalping, just issued in pamphlet form at Chicago. The document appears anonymously, but is probably from the same source which originated the proposal published a few weeks ago suggesting raising a fund by the railroads for the purpose of prosecuting the ticket speculators. The pamphlet gives copious extracts of opinions as to the unprincipled character of many ticket brokers, some of the evidence recently taken at a trial of dishonest scalpers, a copy of the law of Illinois to prevent the handling of tickets by scalpers, comments of newspapers on ticket scalping, a copy of the law of Indiana to prevent the selling of tickets by scalpers, the decision of the Supreme Court of Indiana declaring the anti-scalping law constitutional, a copy of an ordinance to prevent the handling of tickets by scalpers in the city of Augusta, Ga., an article on forged tickets, a copy of the law of Pennsylvania to prevent the sale of tickets by scalpers, the opinion of Judge Ludlow of Pennsylvania declaring the law of that state constitutional, a copy of the Canadian law, and a résumé of the discussions following chairman Cooley's recent inquiry upon the subject. All of this is good, and should be read by every reputable person who is inclined not to resist the devil who offers him a ticket at \$3 under price; but the lineaments of the diminutive rodent who is to perform the daring feat of attaching the tintinnabulating apparatus to the predatory feline are still indistinguishable. The pamphlet gives us no assistance whatever in the problem of discovering him.

Ticket-broker G. G. Lansing, of New York City, in an interview, replies to some of the accusations made in the pamphlet. His main defence is the high standard of require-

ments of the American Ticket Brokers' Association, the by-laws of which are severe on any member who handles doubtful tickets or encourages dishonesty in any way. On the question of forgery Mr. Lansing says:

"Weak lines are constantly finding themselves losing business to strong lines. Their agents, to even up, issue tickets to fictitious persons, whose names are written on these tickets in lead pencil, it being understood that no passenger will use the tickets. Besides, these tickets are only a very small portion of the whole. If there's any forgery it's arranged for by the railroads."

He thinks the statement that reputable business men are parties to gross violations of criminal law is contradictory in terms. Ticket brokers have carried on their business constantly in Pittsburgh, Pa., and no grand jury will indict them. The broker gives more time to the customer than the regular agent does and therefore he is sought out.

The "Montezuma Special" is the name of a brand-new vestibule train which the Mexican Central announces will be put on between New Orleans and the City of Mexico, via Eagle Pass and the Mexican International. The train is to run three times a month each way, leaving New Orleans on the 7th, 17th and 27th, and will make the trip in 72 hours. It will have a dining car and apparently will rival the "Golden Gate Special" in elegance, though nothing is said about bath rooms and ladies' hair-dressers. Whether the absence of these facilities is a concession to local prejudice or otherwise, does not appear. All the cars are to have steam-heating apparatus, the Sewall system and the Porter heater being used. The speed will have to be only about 25½ miles an hour, the distance being 1,835 miles. Even this moderate rate saves about 18 hours over the regular time. The extra charge is \$10.

What seems to be a useful improvement in the Potter draw bar has been adopted by the Chicago & Northwestern. It is to build out the top of the draw head more than the bottom, in such a manner that the majority of all the buffing blows are taken by the top of the draw head. This has materially reduced the damage to the draw bar support, and decreases the strain on the draw timbers during heavy buffing blows. The tendency, now, in car construction is to receive the buffing strains directly upon the centre sills, and the most successful construction of draw gear, thus far, is one which transmits the blows upon the draw head directly to the centre sills. To obtain this, the draw timbers are made as nearly integral with the centre sills as possible.

The stockholders of the New York, Ontario & Western have voted to adopt the English method of railroad accounting, by an independent audit, and have selected E. H. Sewell as their Auditor.

#### Contributions.

##### Highway Crossing Gates.

TO THE EDITOR OF THE RAILROAD GAZETTE:

An article in a recent number of the *Railroad Gazette* on the grade-crossing problem began with the statement that "gates at highway crossings are a great advance over a mere flagman." This is undoubtedly the general opinion. You will perhaps be interested to learn, however, that at least one prominent railroad man declares that gates are no improvement at all over a flagman. Chief Engineer Turner, of the Fitchburg, expresses this opinion freely, though, to be sure, he has set up gates at many crossings where flagmen were formerly employed. Mr. Turner's idea is that a flagman is quite as likely to attend to his business as a gate-keeper, and is more effective as a preventive of accidents, inasmuch as he is a live and active person, and not essentially a machine. Of course the only effectual solution of the difficulty is the separation of grades. This is now being undertaken by the principal Massachusetts companies to an extent which the public does not generally realize.

At several important crossings on the line of the Fitchburg, where gates are used, as for example, at Athol, Mr. Turner has built a two-story house for his gate-tender and lodged him on the upper floor. Two sets of gates are worked from one point at Athol, protecting streets which cross the track within perhaps 100 feet of each other. The advantage of the arrangement adopted there is this, that the gate tender is less likely to have visitors than if he occupied a house or lodge in the usual fashion on the ground. He is indeed, forbidden to admit any one to his loft, and in case an authorized official of the road passing by discovers that he has company he is pretty apt to inquire the reason. The Fitchburg managers are so well pleased with this plan that two-story houses for their gatemen are to be set up at other places. Where this is done, of course, dependence for safety, is placed exclusively on the gates, as the tender is out of reach of excited horses or careless pedestrians, but the advantage of securing stricter attention to duty is believed to more than counter-balance the possible loss in the other direction.

J.

##### Annual Report of the New York Railroad Commissioners.

The sixth annual report of the Railroad Commissioners of New York, for the fiscal year ending Sept. 30 last, has just been transmitted to the Legislature. We summarize its salient features:

**General Situation.**—The year was marked with numerous fluctuations in railroad business. The fairly profitable rates which were generally sustained during the years 1886 and 1887 were seriously cut into by fierce competitions. The report goes on to discuss the bad results of the national law prohibiting pooling, the operation of the fourth section of that law and the important decisions of the

Inter-state Commerce Commission. The last annual report of that body is referred to and its features affecting intra-state roads brought to the attention of the Legislature.

*Summary of Business for the Year.*—A largely increased business on the railroads of the state was done last year. The total for all roads, and the details for each, are given with great particularity in the second volume of the report. A few of the grand totals and most important financial results are here given:

	1887.	1888.
Gross earn. from operation of road.....	\$143,724,491	\$152,122,706
Operating expenses.....	92,439,974	101,605,062
Net earn. from operation of road.....	51,284,516	50,517,644
Income from other sources.....	5,453,671	5,732,753
*Interest paid and accrued.....	24,937,671	26,477,565
Taxes.....	5,018,907	5,252,224
Miscellaneous.....	1,639,697	903,727
*Dividends declared.....	13,822,874	13,791,602
Surplus.....	8,284,403	5,362,203
Stock and debt.....	1,269,501,238	1,272,718,924
Cost of road and equipment.....	1,180,585,382	1,206,848,443
Percentage of gross income to cost of road and equipment.....	4.81	4.65
P. c. of net income to capital stock.....	3.50	3.03
P. c. of divid's declared to capital stock.....	2.19	2.18
Miles of road built in New York State.....	7,383.38	7,437.85
<i>Millions</i> tons of freight carried 1 mile.....	12,094	12,731
Increase in 1888 of 5.27 per cent.....		
Avg. freight earn. per ton per mile (cents).....	0.796	0.797
Avg. freight exp. per ton per mile.....	0.514	0.527
Avg. freight profit per ton per mile.....	0.282	0.270
<i>Millions</i> pass. carried 1 mile (exclusive of elevated roads).....	2,010	2,199
Increase in 1888 of 9.4 per cent.....		
Avg. earn. per passenger per mile (cents).....	2.36	2.30
Avg. exp. per passenger per mile.....	1.51	1.57
Avg. profit per passenger per mile.....	0.85	0.73

\*Includes respectively interest and dividends paid by lessors from rentals received from lessees as follows:

	1887.	1888.
Interest.....	\$7,468,149	\$7,569,059
Dividends.....	3,614,988	3,621,721

*Supremacy of the City of New York.*—The Board gives tables showing the value of the exports and imports of New York, Boston, Philadelphia and Baltimore, which show "the continued supremacy of the city of New York."

#### EXPORTS.

Year ending June 30.	New York.	Boston.	Philadelphia.	Baltimore.
Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1879.....	68.2	10.1	9.7	12
1880.....	67.8	10	8.8	13.2
1881.....	67.6	12.3	7.6	12.5
1882.....	70.5	13.1	8.1	8.3
1883.....	69.3	12.2	7.6	10.9
1884.....	69.2	13.5	8	9.3
1885.....	69.8	12.8	8	9.4
1886.....	71.4	12.4	7.9	8.3
1887.....	68	12.8	7.8	11.4
1888.....	69.8	12.8	6.7	16.7

The total for the past year for the four ports was \$431,914,899, twenty millions less than in 1887, but four and a half millions greater than in 1886. New York's proportion, however, rose from 68 per cent., in 1887, to 69.8 per cent. in 1888. In imports the recent variations are almost imperceptible, New York's percentage falling off a trifle.

*References and Complaints.*—The Board has considered and disposed of fourteen references by the Governor, the Legislature and committees thereof, and numerous complaints preferred by cities, towns, associations, individuals, etc., and each case is reported in the appendix.

*Accidents.*—The record of accidents shows an increase of 21 in the total number of people killed, and 112 injured, as compared with the year 1887, the totals being:

Passengers.			Employés.			Total.		
K. I.	K.	I.	K.	I.	K.	I.		
From causes beyond their own control.....	4	124	30	110	2	6	36	240
By their own misconduct or incitation.....	11	32	130	667	296	234	437	933
Reported as caused by intoxication.....	2	4	1	3	24	25	25	32
Unexplained.....	2	1	49	154	4	12	55	167
The casualties from train accidents (included in the above) were.....	17	161	210	934	326	277	553	1,372
	5	125	34	135	1	5	40	265

Four passengers were killed from causes beyond their own control as compared with 2 in 1887. The Board has to state with great regret that there were 124 passengers injured from causes beyond their own control, as compared with 35 in 1887. This large increase of passengers injured resulted principally from the accidents at Salem, Jan. 23; Vestal, March 16; Dobie's Ferry, March 12; Scio, March 11; Steamburg, Feb. 5; Corning, Aug. 12, and Portville, April 28. Thirty employés were killed from causes beyond their own control, as compared with 9 in 1887; 110 were injured as compared with 72 in 1887. This large increase was the result of the same accidents above alluded to. Getting on or off trains in motion was the cause of half the fatal casualties to passengers. The Board repeats its demand for a law requiring railings on the tops of freight cars. The number of employés killed in coupling cars was 26, and of those injured, 480, as against 20 and 437 the previous year.

The report continues: Great difficulty has been experienced by the railroads in determining upon an automatic car coupler. Much confusion has resulted from different roads adopting different devices. A year ago it was hoped that a solution of this question was in sight in consequence of the Master Car Builders' Association having recommended for adoption what is known as the "Janney Type," i. e., a "vertical plane coupler." Some progress has been made, but not as rapid as it would appear desirable. The Board is not aware of there being any violation of the law. The most serious cause of death to "others" was walking or being on the track. The law forbids walking or being on the tracks of railroads, but it seems practically impossible to enforce it in this country, particularly away from the cities. In the yards and depot grounds railroads make an effort to expel trespassers, but they meet with little encouragement from the civil authorities; this is particularly true with regard to children and beggars picking up coal. In view of the terrible loss of life incident to its violation the law should certainly be enforced with more vigor.

The number ran over at highway crossings shows a material diminution. Of the killed, 12 were at highway crossings protected with gates or flagmen, the same number precisely as in 1887; there were 10 injured as against 9 in 1887. At crossings not protected there were 15 killed and 24 injured, as against 30 killed and 48 injured in 1887. This shows a noticeable reduction. It is possibly the result of many more crossings being protected than was the case in 1887. The Board repeats its language of previous reports

on the subject of crossings, and refers to it again under "Legislation."

*Physical Condition of Railroads.*—The careful inspections and recommendations of the Board have unquestionably led to a great improvement in the physical condition of the railroads of the state. The extent of this improvement will be seen by a perusal of the reports of the inspector and of the accident investigations in the appendix. The improvement in the condition of the bridges, ties, rails, switches and roadbed generally is very marked. No more important function is or can be intrusted to the Board than the supervision of these subjects. It devotes to them its best attention, and it is satisfied that most beneficial results have ensued.

*Heating Cars.*—The report quotes the law, refers to the extensions of time for complying with it granted several roads, and to other facts well known to our readers. The probabilities are that almost all the roads in the state, to which the law is applicable, will by Jan. 1 be equipped. It is possible that some further extensions may be necessary. The Board draws attention to the fact that the act does not apply to railroads less than 50 miles in length \* \* \*. The New York, New Haven & Hartford has declined to conform to the provisions of the act upon the ground that it operates less than 50 miles of road within the state. The Board does not deem that this is a correct interpretation of the law, and has referred the matter to the Attorney-General for his consideration and action. It is somewhat difficult to see why it would be any more agreeable to be burned to death on a road 45 miles in length in the state than on one 145 miles in length. Referring to the conference of Oct. 16 and the subject of a uniform steam heating coupler, the report says: There seems to be no likelihood at present of agreement, until perhaps the slow law of the survival of the fittest asserts itself.

Generally speaking each one of the principal corporations with its connections has adopted a common device, so that exchanges can be made between such corporation and its connections. An intermediate coupling, one end fitting into one system and the other end into another, the Board fears is a clumsy makeshift. As different railroads have, in good faith, equipped their cars with such couplers as each deemed to be the best, it would appear to be a harsh measure for the Legislature to compel the adoption of some other, unless experience shall prove that such enactment is positively necessary to facilitate the exchanges of cars and maintain a proper temperature.

The Board regrets that in the adoption of a steam heating method so little attention has been paid to ventilation. It is an almost universal complaint that the temperature of cars is either kept so high as to be intolerably oppressive or allowed to fall so low as to be uncomfortably cold. Had the suggestion of the Board been adopted, so often and urgently made, viz.: To introduce fresh cold air from the outside, pass it over coils of pipe in the ends of the car, thence into the car through flues in the angle between the floor and sides, such air being kept warm during its passage by the pipes already there, the serious discomfort and detriment to health, incident to bad air and alternations of extreme heat and cold, would have been avoided. As it is no provision has been made for ventilation except by opening a window. This induces a draft upon those in the immediate vicinity, resulting in complaints to the trainmen and conductor, and, finally, in the sealing up of the car with little or no ventilation whatever.

On the New York Central a device has been tried with some success on a few cars, consisting of a window opening horizontally in the side of the roof; the aperture is so arranged that the movement of the train causes an exhaust to take place, which draws the foul air out of the car. These windows open in the direction opposite from that in which the car is moving. Fresh air is admitted by opening a window in the rear. The Board believes that a thermometer should be placed in each car and kept at 70 deg. The Board has said so much upon this subject with so little effect that it will this year submit a draft of a bill to the Legislature upon the matter, in hopes of its receiving favorable action by your body.

*Legislation.*—The Board, in view of the failure of the Legislature to pass a single bill of the many recommended last year, approaches this subject with some hesitation. Impressed, however, with its extreme importance, it knows no better course than to repeat previous recommendations. The report then goes on to discuss at length the proposed bills for enlarging the powers of the commission, for restricting grade crossings, for further regulating the leasing of one road by another, requiring a certificate of exigency from the Board for proposed new roads, prohibiting discrimination against shippers by canal, imposing a penalty on roads for delinquency in making quarterly reports, and others referred to in previous portions of the report.

The report says: Complaints of grade crossing nuisances transcend all others in number and extent. In Buffalo, the worst situated of any city, no progress has yet been made, though this may be partially due to the fact that it was supposed a voluntary agreement would be entered into between the New York Central, the Erie and other corporations, and action under the law was postponed. \* \* \* Under present law, one railroad corporation can lease the road and equipment of another for an indefinite number of years without the consent or approval of the stockholders of either line. This has led to the gravest scandals and outrages upon stockholders, and has been, both in this state and elsewhere, the means of acquiring colossal fortunes at the expense of other people's rights, which it is high time should be put a stop to. \* \* \* The Board is continually embarrassed by the failure of railroads to promptly make quarterly reports. They are sometimes withheld for stock-jobbing purposes, to the detriment of innocent stockholders in the interest of unscrupulous persons.

#### TECHNICAL.

##### Technical Notes.

The Louisville & Nashville is to put in semaphore station signals at the stations on the line between Decatur and Montgomery, Ala., 183 miles.

The Erie Car Heating Co.'s system is in use on the Duluth & Superior Division of the Northern Pacific.

The draw-bridge semaphore signals on the New York Division of the New York, New Haven & Hartford are to be changed from the left-hand to the right-hand side of the posts, in order to make them uniform with the semaphore block signals on this division.

The Chicago, St. Paul & Kansas City is to erect pneumatic drop gates at two street crossings in St. Joseph, Mo. They will be worked from a tower.

Interlocking switches and signals are to be put in at the west end of the yards of the Kansas City Union Depot.

The Old Colony will put in interlocking switches and signals at Forest Hills, Mass., the junction of the main line of the Providence division and the Dedham Branch.

The Chicago, Burlington & Quincy will put the block system in force between Chicago (Western avenue) and Downer's Grove, 17 miles. There will be 9 sections.

#### Locomotive Building.

The Baltimore & Ohio is having built three heavy passenger locomotives, to be finished by March 1. Two of them are being built at the Mt. Clare shops.

The Baldwin Locomotive Works at Philadelphia have nearly completed four consolidation locomotives with 20 x 24-in. cylinders for the Western New York & Pennsylvania road.

The Rogers Locomotive Works, Paterson, N. J., have just finished for the South and North Alabama Division of the Louisville & Nashville two consolidation locomotives.

The buildings, tools, machinery and land of the Hinkley Locomotive Co., at 439 Albany street, Boston, will be sold at auction on Feb. 7, unless previously disposed of at private sale. The buildings include a brick machine shop, foundry, forge and boiler shop, and the machinery and tools include steam engines, hammers, riveter, etc., and also lathes, planers and wood working machinery. The property is subject to a mortgage of \$150,000 on real estate. The auctioneers are S. Hatch & Co., of 9 Congress street.

#### Car Notes.

The Lake Shore & Michigan Southern has placed orders for 500 freight cars, of which 300 will be built by the LaFayette Car Works, and 200 by the Peninsula Car Works, of Detroit, Mich.

The Pittsburgh & Lake Erie has contracted for 500 coal cars, the order being divided between the LaFayette Works, and the Michigan Car Co., of Detroit.

The Wells & French Co., of Chicago, has received an order for 500 freight cars for the Milwaukee, Lake Shore & Western.

The Pullman Car Co. has received an order from the Cleveland, Columbus, Cincinnati & Indianapolis for 700 freight cars.

It is reported that the Wisconsin Central is about to place an order for 500 additional freight cars.

The New York Central & Hudson River has just received from the Gilbert Car Co., of Troy, N. Y., 10 new passenger cars.

It is stated that the Baltimore & Ohio will soon have built three postal cars of special design, and also 200 freight cars.

Of the 30 cars which the Pullman Co. is to build for the road, six will have vestibules when delivered, and the platforms of the rest will be so constructed that they can be vestibuled without alterations. Those vestibuled will be put in service on the express trains between Baltimore and Washington. The limited express trains of the Baltimore & Ohio between Philadelphia and Cincinnati are also to have vestibuled cars.

The Elliott Car Co., Gadsden, Ala., this week completed 20 box cars for the Alabama Great Southern. This makes about 100 which the road has received in the last month.

The Youngstown Car & Manufacturing Co. is building 300 cars for a coke company.

The 500 gondola coal cars for the Western New York & Pennsylvania which the Buffalo Car Manufacturing Co. is building are now nearly all completed.

#### Bridge Notes.

The New Jersey Steel & Iron Co. has been awarded the contract for the iron work on the new bridge at Southard street, Trenton, N. J.

An iron bridge is to be built over Fourche Bayou, near Little Rock, Ark.

The Wisconsin Central is building an iron bridge across the river at Stevens Point, Wis., that will cost \$25,000.

The Jones & Benner Co., of Philadelphia, has retired from the business of designing and construction of bridges, buildings, etc., and President W. M. Levering and Secretary W. A. Garrigues have formed a partnership under the name of Levering & Garrigues to continue the same business at 218 South Fourth street, Philadelphia.

The following proposals were received by the Superintendent of Public Works, Albany, N. Y., for several bridges: Iron bridge at Frankfort: Groton Bridge Co., Groton, N. Y., \$2,294; Shepard & Son, Havana, N. Y., \$2,403; Rochester Bridge & Iron Works, \$2,594; King Iron Bridge & Mfg. Co., Cleveland, O., \$3,185. Iron swing bridge at Ithaca: Shepard & Son, \$2,271; Rochester Bridge & Iron Works, \$2,550; Groton Bridge Co., \$2,795; Hilton Bridge Co., Albany, \$2,800; King Iron Bridge & Mfg. Co., \$2,958. Lift bridge at Rochester: Hilton Bridge Co., \$20,960; Rochester Bridge & Iron Works, \$21,640; King Iron Bridge & Mfg. Co., \$26,900. The contracts were awarded to the lowest bidders.

Proposals for erecting the superstructure of an iron-truss viaduct bridge with 50 ft. span will be received by the Bridge Committee of the City of Kenosha, Wis., until Jan. 20. Address John T. Yule, Kenosha, Wis.

The new Hackensack River drawbridge for the Newark & New York road has been completed. The draw may be operated by steam or hand.

Proposals are wanted until

Pennsylvania lines west of Pittsburgh, and is now supplying the companies.

The American Railway Equipment Co. has been organized in New York for the manufacture of the Stearns car box and other railroad equipments. The capital stock is placed at \$1,000,000, and the officers are: O. S. Burr, President; O. S. Stearns, Superintendent; A. S. Hatch, Vice-President and Treasurer, and Thomas R. White, Secretary.

The Louisville & Nashville has placed at various places along its line several of the switches made by the Hart-Wood Switch Co., of Birmingham, Ala.

The National Surface Guard Co., of Chicago, has completed an order for 140 iron surface cattle guards for the Elgin, Joliet & Eastern road, and has recently furnished the Southern Pacific with 20 guards. The guards are made of strips of iron  $\frac{1}{2}$  in. thick, and 3 to 4 in. wide, and each guard weighs about 600 lbs. The strips are placed alternately in the guard, making an uneven surface. A. W. Wright is President of the company.

The Boyden Power Brake Co. will soon commence building works for manufacturing brake equipments for cars and locomotives.

Williams, White & Co., of Moline, report the receipt of orders recently for five bulldozer forging and bending machines.

The Servis railway tie plate, made by the Dunham Mfg. Co., of Boston, Mass., is being largely used in new construction work on the Pacific slope. Its great value in economy has been very strongly shown in the trials made during the last few months on roads both East and West.

The business of the Union Indurated Fibre Co., of New York, has been transferred to a new company, the United Indurated Fibre Co., with a capital of \$500,000, which will continue the manufacture and sale of indurated fibre ware, with factories located at several points and with offices in New York, Boston and Chicago as heretofore.

The Revolving Semaphore Co. has been organized by A. T. Leman, Fred F. Bennett and Wm. S. Brewster, of Chicago, with a capital stock of \$250,000, to manufacture railroad signals and other appliances for the use of railroads.

Conn Brothers, of Winchester, Ky., have built 16 new depots for the Maysville & Big Sandy, the Cincinnati Division of the Chesapeake & Ohio, within the past three months.

The Standard Car Co. has been organized in Bridgeport, Conn., to build, repair and deal in railroad equipment. The capital stock is \$40,000. Goodwin Stoddard is President.

The Consolidated Coal Co., of St. Louis, will receive proposals until Feb. 1 for excavating 300,000 yards of earth from a ditch 40 ft. wide and from 10 to 30 ft. deep. The work can be sublet. Specifications can be seen at the office of Lewis Stockett, Chief Engineer, Laclede Building, St. Louis, or at office of A. T. Bunker, Superintendent, Danville, Ill.

The East Tennessee, Virginia & Georgia has awarded the contract to build a new freight depot at Knoxville, Tenn., to Houghton & Hood. It will be of brick, and will cost about \$30,000.

The Cleveland Frog & Crossing Co., of Cleveland, O., has made all the frogs and crossings for the second track laid by the New York, Pennsylvania & Ohio from Cleveland to Youngstown, O., and for the new standard gauge for the Cleveland & Canton, and also for a new road built in Michigan the past year. Besides these contracts the company has made a large amount of frogs and crossings for the Lake Shore & Michigan Southern, the "Nickel Plate," the Cleveland, Lorain & Wheeling, the Valley, the Wheeling & Lake Erie and many other roads. To complete these orders the company has been compelled to run double time for several months. The Cleveland Frog & Crossing Works have been manufacturing frogs and crossings for some three or four years, under Geo. C. Lucas' patents for steel filings. In July, 1888, the works became incorporated as the Cleveland Frog & Crossing Co., with capital stock of \$100,000, and with N. P. Bowler as President, and Geo. C. Lucas as General Manager. The company has built large works on the line of the N. Y., P. & O., and equipped its shop with special tools for this kind of work. The shop is lighted by a Brush electric six-light dynamo.

#### Iron and Steel.

The business of the Hartman Steel Works, at Beaver Falls, Pa., heretofore conducted by the Hartman Steel Co., Limited, has been transferred to Carnegie, Phipps & Co., Limited, by whom it will hereafter be controlled. The Works will hereafter be known as the Beaver Falls mills, operated by Carnegie, Phipps & Co., Limited.

G. W. Stetson & Co., 69 Wall street, New York, and Edmund D. Smith & Co., of 222 South Third street, Philadelphia, have been appointed sales agents of the pig iron produced by the DeBardeleben Coal & Iron Co., of Bessemer, Ala. In the manufacture of this iron the furnaces have six pig beds, and each cast is allowed to cool naturally, thus avoiding the chilling tendency from artificial cooling.

Carnegie, Phipps & Co. have been awarded the contract for the rails of the extension of the Wheeling & Lake Erie road from Bowerstown to Martin's Ferry, O. About 4,000 tons will be required.

During the year 1888 67 Smith furnaces and gas producers were introduced in the United States and Canada, and 16 are now being built, including the following: Four for the Minnesota Car Co., Duluth, Minn.; two for Union Steel & Iron Co., St. Joseph, Mo.; two for the American Wire Nail Co., Anderson, Ind.; two for the Tredegar Company, Richmond, Va.; one for the Richmond Standard Spike Company, Manchester, Va., and one for the Virginia Nail & Iron Works Co., Lynchburg, Va.

The Canton Steel Works, of Cauton, Ohio, have been bought by Pittsburgh parties for \$200,000. The new firm is to be known as the Bolton Iron & Steel Co.

The Jefferson Iron Works, of John A. Kruse & Co., of Chicago, Ill., have broken ground for their 50-ton charcoal iron furnace at Jefferson, Tex. When the furnace is built car works will probably be erected.

The entire plant of the Wheeling Steel Works, at Wheeling, W. Va., has been closed for an indefinite period for the purpose of making repairs and taking stock.

The Linden Steel Co., Limited, of Pittsburgh, has appointed Ripley & Bronson, of St. Louis, sales agents in the West and South of the plates made by the company.

The Clinton Rolling Mill in Pittsburgh, formerly operated by Graff, Bennett & Co., but which has lately been operated by the firm's assignees, has been closed. The Clinton blast furnace, also operated by the assignees, and producing about 50 tons of pig iron per day, will also be blown out.

The Etowah Mining & Manufacturing Co., owners of 17,000 acres of mineral lands and the Cartersville Steel & Furnace Co., of Cartersville, Ga., have been consolidated as the Tennessee & Georgia Iron & Steel Co., and will erect five furnaces and a rolling mill at Cartersville, Ga.

The Green Forest Furnace Mfg. & Land Improvement

Co. has been organized in Lexington, Va., with a capital stock of \$500,000, to develop the Buena Vista iron mines at Green Forest, on the Richmond & Allegheny and Shenandoah Valley roads, lay out a town and build a 200-ton iron furnace.

The Trumbull Iron Co., of Girard, Ohio, has commenced work on another addition to the puddling department of its mill, and a number of new puddling furnaces will be erected. When completed the company will have 27 puddling furnaces in operation.

The Canton Steel Roofing Co., of Canton, O., has nearly completed an addition to its shops 90 x 75 ft. and two stories high, making the size of the entire buildings 90 x 200 ft.

#### The Rail Market.

**Steel Rails.**—No large sales are reported, and the Eastern market is quiet. The quotations are \$27@27.25 at Eastern mills. The shipments of the different mills during the year 1888, according to the *Iron Age*, were as follows: 1, 85,448 gross tons; 2, 82,363; 3, 138,946; 4, 29,040; 5, 114,675; 6, 128,310; 7, 168,040; 8, 121,960; 9, 136,029; 10, 25,110; 11, 126,016; 12, 6,569; 13, 39,168; 14, 3,705 gross tons. Total, 1,206,279 gross tons. These figures do not include light rails. The total sales for 1888 delivery up to Jan. 1 are reported officially at 434,381 tons, out of a total allotment of 777,000 tons.

**Old Rails.**—Sales have aggregated 1,000 tons of American at \$23 for Jersey City delivery. Quotations, \$23@ \$23.50.

**Track Fastenings.**—Quotations: Spikes, 2.10c. delivered, and angle bars 1.85@1.90c.

#### The Bicycle Locomotive.

The Portland Co., of Portland, Me., which is building for Hon. E. Moody Boynton a locomotive to run upon a single rail, the equilibrium being maintained by an overhead rail, guiding wheels fixed to the tops of the vehicles, has received an order to build a second engine and also a double-deck passenger car. The engines are of a capacity similar to a medium standard gauge locomotive, and a track is being built for a trial of the invention. The location of this track is not given, but it is probably somewhere near Boston.

#### The Metal Production of 1888.

The *Engineering and Mining Journal*, as usual, sums up the production of copper, lead and zinc for the past year. The great interest centering in the affairs of M. Secretan's syndicate justifies an elaborate historical essay on the subject.

It may be said briefly that the price of Lake copper had fallen very steadily in the New York market from 46 $\frac{1}{4}$  cents per pound in 1864 to 11 cents for 1886, and in the London market the price of Chili bars had fallen from £82 10s. for 1875 to £44 for 1886. This was a lower price than most mines could produce at, and the stocks of copper were very seriously depleted when the French commenced buying in the fall of 1887, sending the price of Chili bars from £39 15s. in September, 1887, to £100 in October, 1888, and increasing the stock from 43,201 to 104,000 tons. In this country the price of Lake copper, which was 10 cents in June, 1887, and only 10 $\frac{1}{2}$  cents for the month of October, was 17 cents for December, and has averaged 16 $\frac{1}{4}$  cents for the year 1888.

This higher price has stimulated production, which had fallen from 76,322 gross tons in 1885 to 71,980 in 1886, so that it rose to 82,442 in 1887 and 105,357 in 1888, making this country now the producer of 41 $\frac{1}{2}$  per cent. of the world's copper, a very noticeable rise from 1864, when we produced 8,000 tons.

The copper was produced as below:

	Gross tons.
Calumet & Hecla.....	22,501
Other Lake Superior mines.....	16,271
Total Lake Superior.....	38,772
Arizona.....	14,821
Montana.....	44,000
Other and from imported ores.....	7,724

It will be noticed that Lake Superior furnished about 37 per cent. of our copper; in 1872 it furnished its maximum proportion, 10,981 tons, or 95.7 per cent. of our output.

From data furnished by the French syndicate, the *Journal* is able to give the following table showing the world's production for 1888 in gross tons:

Syndicate mines.....	8,000
Australia.....	1,000
Bolivia.....	27,000
Chili.....	7,250
Cape of Good Hope.....	1,500
England.....	11,500
Japan.....	4,000
Mexico (Boleo).....	1,484
Newfoundland.....	1,800
Norway and Sweden.....	52,250
Spain and Portugal.....	115,784
Total Syndicate mines.....	16,000
Germany.....	18,216
And the mines not included above.....	150,000
Total foreign production.....	105,357
American production.....	255,357

The production for 1887 was 223,957, and the gain for this year was 31,400 tons of which we gained 26,784 tons, or about 28 per cent. Our exports of copper in ore, pigs and manufactured, amounted in value to \$11,492,021, as against a value of \$3,727,402 for 1887, which was the lowest value since 1883. Our imports of copper in ore, pigs, etc., are valued at \$431,625.

Our production of lead, which was 28,000 short tons in 1847 and declined to 14,100 in 1861, has increased to 189,000 in 1888. The sources from which this lead came are approximately as follows: Colorado 65,000 tons, Utah 22,000 tons, Idaho and Montana 39,000, Missouri and Kansas 29,000 tons. About 10 per cent. of the lead produced was from Mexican ores which were imported free, as the value of their silver is greater than that of their lead. The price of lead, which was 6.25 cents per pound in 1870, has fallen to 4.12 cents for last year. Our imports for the year were valued at \$336,449, and our exports at \$121,822.

The production of zinc, which in 1873 was only 7,343 short tons, is estimated for 1888 at 57,000 tons of 2,000 pounds. The principal production is in Illinois, Kansas and Missouri. They produce only about 15 per cent. of a total product. Our imports for the year have been 250 tons, against 3,300 tons in 1887.

The product of coal, iron and precious metals is estimated as follows:

Anthracite, tons.....	40,000,000
Bituminous, ".....	80,000,000
Iron ore, ".....	11,400,000
Pig iron, ".....	6,000,000
Steel rails, ".....	1,350,000
Silver, troy ounces, 43,000,000.....	\$55,470,000
Gold, troy ounces, 1,650,000.....	34,105,500

It is estimated that the value of our mineral products for the year will exceed \$550,000,000, as against \$542,284,225 for last year.

#### The Franklin Institute "John Scott" Medal.

The Franklin Institute, of the state of Pennsylvania, has awarded to John Gates, the inventor of the sight-feed lubricator, the John Scott legacy medal and premium. This invention refers to the Gates method of lubricating the cylinders and internal working surfaces of steam engines by oil automatically fed in visible drops up through a liquid inlet closed in a transparent chamber, called a "sight-feed," and is owned and controlled by the Seibert Cylinder Oil Cup Co., of Boston, Mass.

#### RAILROAD LAW—NOTES OF DECISIONS.

##### Powers, Liabilities and Regulation of Railroads.

The Supreme Court of Texas holds that under the state statute providing that a private corporation may be sued in any county in which it has an agency or representative, and a railroad corporation in any county through which its road runs, a railroad company may be sued in a county through which it operates its road, and in which it has an agent, though the cause of action arose in another county.<sup>1</sup>

In New York the Court of Appeals rules that when a railroad liable to taxation under the Corporation Tax act is operated under the corporation franchise by a receiver appointed by the court, and he has in his hands money arising from the gross earnings sufficient to pay the taxes accrued under that act, the state has a paramount right to collect such taxes from such money.<sup>2</sup>

In Pennsylvania the Supreme Court holds that an execution sale, upon a judgment recovered by a holder of a portion of a series of railroad trust mortgage bonds, upon the bonds held by him, will not convey a title to the property, rights and franchises of the railroad company covered by the trust mortgage, freed from the incumbrance of such mortgage.<sup>3</sup>

In Illinois the Federal Court decides that where one railroad company leases the property of another, agreeing to pay as part of the rent interest on certain mortgage bonds, non-payment of the rent and interest being a cause of forfeiture, receivers of the lessee company, appointed by the Court to preserve its system intact for the benefit of the company and its creditors, are liable for the rent and interest accruing during the term of their receivership. Where the Court appoints receivers for a railroad company, for the benefit of that company and its creditors, no part of the expenses of the receivership are chargeable against the property of another railroad company, leased by the insolvent company, the receivership not being for the benefit of the lessor or its creditors.<sup>4</sup>

In Missouri the Federal Court rules that although a judgment has been obtained on coupons of county bonds issued under the Missouri act of 1865, incorporating the Missouri & Mississippi Railroad, which provided that the amount of special tax to be levied in any one year for their payment should not exceed one-twentieth of one per cent., *mandamus* will not lie to compel the levy of a higher special tax to pay such judgment, as the holders of such bonds are chargeable with notice of the provisions of the statute under which they are issued.<sup>5</sup>

The Iowa Code authorizes a temporary injunction to restrain an act done or threatened which would produce a great or irreparable injury to plaintiff, which is in violation of his rights respecting the subject of the action, or which would tend to render ineffectual any judgment he might recover in the proceedings. The Supreme Court holds that neither under this section nor by common law, is a railroad company entitled to an injunction restraining defendant from bringing an action at law to recover rent due from the company on a lease which it is seeking to set aside as fraudulently made by its officers: as such fraud would be a complete defense to the action for rent, and, if once established, it would be a bar to any further suits for the same purpose.<sup>6</sup>

In Indiana the Supreme Court holds that the statutes of the state prescribe no penalty for railroad failing to restore the highway intersected by its track, but that the performance of its duty in this respect may be enforced by mandate.<sup>7</sup>

In Georgia the Supreme Court rules that a railroad company which with knowledge and without objection allows a person to rent an office on its right of way, and put up a sign styling it the office of the company, is liable for ties purchased by such person in its name, although there was another neighboring railroad company of the same name.<sup>8</sup>

##### Carriage of Goods and Injuries to Property.

In Kansas a railroad entered upon the land of another and constructed a railroad, by consent, and upon an agreement whereby certain conditions were subsequently to be performed by the company. Both parties treated the taking of the land as a permanent appropriation for a right of way, and about four years later the land owner, claiming that the railroad company had not performed the conditions of the contract, instituted condemnation proceedings to obtain compensation for the land taken. The Supreme Court holds that the compensation must be ascertained and assessed as of the time when the company first took possession of the land and occupied it as a right of way, rather than of the period of the condemnation proceedings.<sup>9</sup>

The Supreme Court of Texas decides that fire caused by sparks from an engine is *prima facie* evidence of negligence; and, where the company offers no evidence to rebut such presumption, it cannot complain of a charge that it can be rebutted only by proof that the engine was properly constructed with the best approved appliances for preventing escape of fire. In such case the measure of damages is the value of the grass as it then stood, with interest, and not the difference in the value of the land before and after the fire.<sup>10</sup>

A Virginia statute provides that where railroads run through inclosed farms, and the company has paid to the owner of the land damages for making fences on each side, and for keeping them in repair, the provisions of the act imposing a penalty on the company for failure to build and keep such fences in repair shall not apply. The Supreme Court of Appeals hold that the company have not the option of fencing the roadbed or suffering the penalty, but that an assessment of damages, in the report of commissioners, allowing for the cost of fencing, is proper and binding.<sup>11</sup>

In North Carolina the defendant railroad, in constructing its roadbed, cut across the embankment of plaintiff's lead ditch, thereby draining more surface water into the ditch than it could carry off, and flooding plaintiff's land. The ditches constructed by defendant were on the land condemned and paid for by it, including "the legal incidental damages to the lands not taken," and were necessary for the purposes of the roadbed, which could not have been drained in any other way. The Supreme Court rule that defendant's act was lawful, and that for whatever damage it caused it was not liable.<sup>12</sup>

In Georgia the Supreme Court held that where the killing of stock by a locomotive is fully explained by uncontradicted testimony, though of employers only, that the accident took place before daylight, in a fog so dense as to prevent the animals being seen in time to save them, with which the

circumstances do not disagree, the presumption of negligence arising from the accident is rebutted, such evidence, if not discredited, being entitled to respect, and a verdict for plaintiff should be set aside.<sup>13</sup>

#### Injuries to Passengers, Employees and Strangers.

In Texas the Supreme Court rules that partial intoxication does not excuse want of ordinary care and prudence on the part of a passenger, and a railroad company need exercise no higher degree of care toward a person partially intoxicated than is required in case of persons not intoxicated.<sup>14</sup>

In the same state the same Court holds that where the plaintiff, who was 62 years of age, had three ribs broken, and his side bruised, and was rendered insensible by an accident while a passenger on defendant's train, and suffered greatly for a considerable time afterward, and the testimony as to his probable final recovery was conflicting, one physician stating that it was not improbable that paralysis might ensue, a verdict of \$3,750, in an action for the injuries is not excessive.<sup>15</sup>

In Georgia the Supreme Court holds that a railroad company is liable in damages for the wrongful homicide of a customer committed by its depot agent in his office where the customer was lawfully there for the transaction of business with such agent appertaining to his agency. While, as a general rule, any mental disease or infirmity which would excuse the agent from criminal responsibility would also excuse the company from civil responsibility, this would not be available if the company employed the agent, and assigned him to duty, with knowledge of his insane condition, or of his being subject to sudden fits of insanity.<sup>16</sup>

In South Carolina the Supreme Court rules that it is not contributory negligence *per se* for a passenger to sit with his elbow out of the car window.<sup>17</sup>

In Oregon the Supreme Court decides that a railroad may require all persons before taking passage on its passenger trains to procure tickets to enable them to ride, and, in default thereof, to pay an additional sum, when it has furnished proper conveniences and facilities to travelers for procuring tickets. But if the railroad has failed or neglected to furnish the traveler the opportunity to procure a ticket, and he applies for a passage, or enters the train without having such ticket, but offers to pay the regular fare, it cannot lawfully reject or eject him.<sup>18</sup>

In Massachusetts the Supreme Judicial Court holds that although danger from dangerous machinery or appliances or structures is incident to employment upon them, yet the risk is not assumed by the employé unless he knows the danger, or unless it is so obviously incident that he will be presumed to have known it. Few and exceptional permanent erections so near to a railroad track so as to render the occupation of a brakeman dangerous do not constitute a danger so obviously incident to the employment that a brakeman, unacquainted with the road, making his first trip over it as brakeman, and who was not informed of the erections nor cautioned in regard to them, can be held to have assumed the risk of injury from them; nor can it be said, as matter of law, that he was bound to know and appreciate the danger.<sup>19</sup>

In Georgia, the Supreme Court rules that two or more chartered railroad companies whose lines terminate at the same point, that is, at the same town or city, are not bound as a matter of law to have and use separate terminal facilities, but may within the corporate limits use the same track in common with or without common ownership, and when they do so, a track thus laid, though the exclusive property of one of the companies, is, for the time being, the track of each company using it, and the proprietary company is not responsible to its employees for personal injuries which they sustain solely by reason of the negligent use of the track by employees of another company. The redress for such injuries is against the company whose employees are at fault.<sup>20</sup>

In Texas the Supreme Court holds that a railroad company cannot, by making and enforcing suitable regulations to keep its machinery, roadbed and appointments in safe condition, relieve itself from liability for injuries resulting to its servants from the failure of its agents actually to use such care as the law prescribes. In this case there was evidence on the trial that the derailment of the engine and tender, by which plaintiff was injured, was caused by the falling of a brake-shoe, which, if properly fastened, could not have fallen, and that the fastening was so made as to render any defect easily seen. It was contended that the engine and tender had recently been inspected and found in good order; but it was shown that on that inspection defective machinery, in sight of the engineer who made the inspection, was not seen by him to be out of order, and that the engine was considered dangerous. The railroad is held liable.<sup>21</sup>

In Virginia the Federal Court rules that it is negligence on the part of a railroad company to employ as a brakeman a boy so young as not to know the risks of the service, if the agent of the company making the contract knows that he is a minor, and that the contract is made without the consent of the parents; but not if the agent believes from his statements and his general appearance that he is not a minor.<sup>22</sup>

In Georgia it is held by the Supreme Court that a railroad sending its locomotive engineer (employed by the month) with one of its engines to haul temporarily for another company the trains of the latter over the line of such latter company, is not responsible to the engineer for the bad condition of the track, nor for the want of adaptation of the engine to the track, it not being alleged that the employer company knew of such bad condition or want of adaptation, and concealed its information.<sup>23</sup>

In Massachusetts the Supreme Judicial Court rules that want of due care in a traveler approaching a railroad crossing is not necessarily shown by proof that he was driving at a trot, and by absence of affirmative proof that he looked for a coming train, when the view was obstructed by cars standing on the track, leaving only an opportunity for a casual glance at the track at a single point in one direction from the crossing. Nor is want of due care necessarily shown by absence of affirmative proof that the traveler listened for a coming train, when it appears that a person standing near by at the time heard no sound of an approaching train until the whistle was sounded upon the traveler's being discovered on the track.<sup>24</sup>

In Virginia a track-walker of a railroad company discovered a man about 10 o'clock at night lying on the track in such position that a passing train would kill him, and, when he aroused him and told him the train was coming presently and he had better get off the track, the man raised his head, leaned on his elbow, and, by an exclamation, assented to the suggestion, showing no signs of intoxication; thereupon the track-walker passed on, and the man was killed two hours afterward by an express train. The Supreme Court holds that the track-walker was guilty of no negligence which rendered the railroad company liable.

In Utah a switchman of defendant passed to the east side of a moving flat car on which he and defendant's foreman were riding, got down upon a step at the side of the car, and stood with his face to the car, ready to alight and throw a switch, as directed by the foreman, when he was struck by a switch-stand which extended to within nine or ten inches of the car, and was injured. One of defendant's rules, of which plaintiff had notice, declared that no buildings or material

would be allowed nearer than six feet to the main track, or nearer than five feet to a side track. Most of the yard work was done on the west side of the track, but there was a ladder on the east side of the car, and it was the most convenient place to alight. The switch-stand had stood for 14 years, and was above ground, though a ground-switch would have answered every purpose. Plaintiff had worked in the yard for seven or eight days, but had not noticed the position of the switch stand relative to the track. The Supreme Court affirms a verdict against defendant railroad.<sup>25</sup>

<sup>1</sup> G. H. & S. A. Co. v. Horne, 98 W. Rep. 440.

<sup>2</sup> Cent. Trust Co. v. N. Y. C. & N. R. Co., 13 Cent. Rep. 405.

<sup>3</sup> Com. v. Susquehanna R. Co., 13 Cent. Rep., 448.

<sup>4</sup> Brown v. T. P. & W. R. Co., 35 Fed. Rep., 441.

<sup>5</sup> U. S. v. Macon Co. Ct., 35 Fed. Rep., 483.

<sup>6</sup> Dubuque & C. R. Co. v. C. F. & M. R. Co., 39 N. W. Rep. 691.

<sup>7</sup> Cummins v. E. & T. H. R. Co., 15 West. Rep., 456.

<sup>8</sup> F. M. & G. R. Co. v. Varnedoe, 7 S. E. Rep., 129.

<sup>9</sup> Wier v. St. L. E. & W. R. Co., 19 Pac. Rep., 317.

<sup>10</sup> G. H. & S. A. R. Co. v. Horne, 9 S. E. Rep., 440.

<sup>11</sup> N. & W. R. Co. v. Stephens, 7 S. E. Rep., 251.

<sup>12</sup> Bell v. N. S. R. Co., 7 S. E. Rep., 467.

<sup>13</sup> Geo. R. & B. Co. v. Wall, 7 S. E. Rep., 639.

<sup>14</sup> Mo. Pac. R. Co. v. Evans, 9 S. W. Rep., 325.

<sup>15</sup> Mo. Pac. R. Co. v. Aikin, 9 S. W. Rep., 439.

<sup>16</sup> Christian v. C. & R. R. Co., 7 S. E. Rep., 216.

<sup>17</sup> Quinn v. S. C. R. Co., 7 S. E. Rep., 615.

<sup>18</sup> Poole v. N. P. R. Co., 19 Pac. Rep., 107.

<sup>19</sup> Scanlon v. B. & A. R. Co., 7 N. Eng. Rep., 141.

<sup>20</sup> Geo. R. & B. Co. v. Freddie, 7 S. E. Rep., 214.

<sup>21</sup> Mo. Pac. R. Co. v. McElvea, 9 S. W. Rep., 313.

<sup>22</sup> Goff v. N. & W. R. Co., 36 Fed. Rep., 300.

<sup>23</sup> Dunlap v. R. & D. R. Co., 7 S. E. Rep., 283.

<sup>24</sup> Hanks v. B. & A. R. Co., 7 N. Eng. Rep., 139.

<sup>25</sup> Va. M. R. Co. v. Boswell, 7 S. E. Rep., 283.

<sup>26</sup> Pedcock v. U. P. R. Co., 19 Pac. Rep., 191.

#### General Railroad News.

##### MEETINGS AND ANNOUNCEMENTS.

###### Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

*Central Pacific*, \$1 per share, payable Feb. 1.

*Cumberland Valley*, quarterly, 2 per cent., payable Jan. 1.

*Iron*, semi-annual, 1 per cent.

*Louisville & Nashville*, semi-annual (scrip.), 2 per cent.

*Pittsburgh & Lake Erie*, 3 per cent., payable Jan. 18.

*Pittsburgh, McKeesport & Youghiogheny*, 3 per cent., payable Jan. 1.

*Portland & Rochester*, 3 per cent., payable Jan. 15.

*St. Louis & San Francisco*, semi-annual, 3½ per cent. on the first preferred stock, payable Feb. 11.

*Wheeling & Lake Erie*, 1 per cent. on the preferred stock, made payable Feb. 15.

###### Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

*Carthage & Adirondack*, special meeting, 160 Broadway, New York, Jan. 23.

*Knoxville & Ohio*, annual meeting, Knoxville, Tenn., Jan. 21, to consider the question of approving the lease of the Knoxville & Ohio to the East Tennessee, Virginia & Georgia, heretofore made in accordance with resolutions adopted by the board of directors.

*Fort Wayne & Jackson*, annual meeting, Jackson, Mich., Jan. 25.

*Pittsburgh & Lake Erie*, annual meeting, Pittsburgh, Pa., Jan. 22.

*St. Catharines & Niagara Central*, annual meeting, Montreal, Jan. 28.

*Sheffield Terminal Company*, annual meeting, Sheffield, Ala., Jan. 31.

###### Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

*The Association of American Railway Accounting Officers* meets at the Southern Hotel, St. Louis, Mo., Jan. 24, 1889.

*The American Institute of Mining Engineers* will hold its nineteenth annual meeting in New York city, Feb. 19. The head-quarters will be at the Union Square Hotel.

*The National Association of Railway Surgeons* holds its annual convention in St. Louis, Mo., May 2, 1889.

*The New England Railroad Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

*The Western Railway Club* holds regular meetings on the third Tuesday in each month at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.

*The New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

*The Central Railway Club* meets at the Twift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

*The American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, New York.

*The Boston Society of Civil Engineers* holds its regular meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday in each month.

*The Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

*The Engineers' Club of St. Louis* holds regular meetings in St. Louis on the first and third Wednesdays in each month.

*The Engineers' Club of Philadelphia* holds regular meetings at the house of the Club, 1,122 Gerard street, Philadelphia.

*The Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., in its rooms in the Penn Building, Pittsburgh, Pa.

*The Engineers' Club of Kansas City* meets at Kansas City, Mo., on the first Monday in each month.

*The Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

*The Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m. on the third Saturday in each month.

###### American Society of Civil Engineers.

The annual meeting of the American Society of Civil Engineers was held at the house of the Society on the 16th and 17th inst., and was largely attended.

The annual report of the Board of Direction showed a net increase for the year in the number of persons connected with the Society of 133, the total membership in all classes now being 1,243. The losses were 15 by death and 8 by resignation. The increase in the members was about 12 per cent, and in the juniors 20 per cent. Twenty-two meetings of the Society have been held during the year and 19 meetings of the Board of Direction.

A special committee is in charge of the matter of attempt-

ing to determine whether or not a sufficient amount of money can be raised to build a large and suitable house for the Society, but the Board of Direction has decided in the meantime to build an extension to the present house, which will accommodate the meetings of the society and a library temporarily.

The Norman medal for the year 1887 was awarded to Mr. Desmond Fitz Gerald, for his paper on Evaporation. The Rowland prize for the year 1887 was awarded to Mr. William Metcalf, for his paper on Steel, its properties, its uses in structures and in heavy guns.

The Norman Medal for 1888 was awarded to Mr. E. E. Tratman for a paper on English Railroad Track, and the Rowland prize to Mr. Clemens Herschel for his paper on the Venturi Water Meter.

Mr. Don J. Whitemore, Chief Engineer Chicago, Milwaukee & St. Paul, read a paper in discussion of the report of the Committee on the "Proper Relations to each other of the Sections of Railway Wheels and Rails," which appeared in the July number of the *Transactions* of the Society. Mr. Whitemore advocated a cylindrical, as against a conical, tread to the wheel and a perfectly flat top to the rail. The paper was accompanied by tables and photographs and sections of rails.

The election resulted in the choice of the following officers: President, M. J. Becker; Vice-Presidents, A. Fteley, E. L. Corbett; Secretary and Librarian, John Bogart; Treasurer, George S. Greene, Jr.; Directors, Charles B. Brush, Eliot C. Clarke, Walter Katté, Robert E. McMath, William P. Shire.

There was a contest for the presidency, which resulted in a vote of 311 for Mr. Becker and 283 for M. T. C. Clarke.

The programme for Thursday was a trip to the New Croton Aqueduct Gate House, at 135th street; to the yard of the Department of Docks to see the mode of making 70-ton blocks of biton, under Mr. George L. Grune, Jr., Engineer-in-Chief of the department; to the Brooklyn end of the East River Bridge to see the new cable driving plant; and to the East Fifteenth Street Station of the Consolidated Gas Co. to see the new triple section telescopic gas holder, designed and built by Mr. Thomas F. Rowland, member of the Society.

A reception for gentlemen was to be held at the House of the Society in Twenty-third street, commencing at two o'clock.

###### Civil Engineers' Society of St. Paul.

The annual meeting was held Jan. 7, 15 members present. E. W. Woodward was elected a member. Mr. Loweth, the President, made an address on the test method of increasing the usefulness of the Society. The following officers were elected: President, Charles F. Loweth; Vice-President, S. D. Mason; Secretary, George L. Wilson; Treasurer, F. W. McCoy; Librarian, A. Münster. Mr. W. W. Curtiss read a paper upon the standpipe for water-works, which was illustrated by working drawings.

###### Engineers' Club of Kansas City.

A meeting was held Jan. 7, 18 members and 3 visitors being present. The following officers were declared elected: President, O. B. Gunn; Vice-President, W. H. Breithaupt; First Director, Wynkoop Kierstead, Second Director, S. H. Yonge; Secretary, Kenneth Allen; Treasurer, F. W. Tuttle; Librarian, Frank Allen. The Secretary was instructed to correspond with other local societies, more particularly those of the Association, to obtain their views as to the advisability of providing for transfer of membership from one society to another without payment of initiation fees.

The retiring President, William B. Knight, read an address, and resolutions were adopted expressing the gratitude of the club to Mr. Knight for his services. Mr. Knight was chosen to represent the club on the Board of Managers of the Association.

###### Engineers' Club of St. Louis.

The 239th meeting was held Jan. 2. The following members were elected: F. W. Abbott, L. Bartlett, O. W. Ferguson, A. N. Milner, L. Parker and H. R. Stanford.

Mr. Robert Moore, as Chairman of the committee, read a report on the communications on the subject of highway bridges which had been received from the Engineers' Club of Kansas City, the Western Society of Engineers, and the Indiana Society of Civil Engineers and Surveyors. These communications asked for an expression of opinion by the club upon the following suggestions: That the supervision and inspection of highway bridges should be placed in the hands of a state engineer; that the law should establish certain standard general specifications for such bridges; that, in order to facilitate the employment of engineers by county boards, a scale of charges for such work should be adopted by the engineering clubs; that a convention of delegates from various clubs should be held to consider and act upon these and other propositions.

The committee of the St. Louis club considered these suggestions in order. It is the judgment of the committee that the only way to improvement in highway bridge practice is to bring such bridges under the supervision of skilled engineers acting for the public, but this can only be done satisfactorily by putting the work under engineers appointed by the state. The counties cannot be relied on to choose competent engineering advice.

The committee thinks that it would be well to provide that the plans and specifications of all bridges exceeding a certain span, should be subjected to the approval of a state engineer, who might appoint an inspector to see that the work was properly carried on, the inspector to be paid by the state. It should also be the duty of the state engineer to examine into and report upon failures of highway bridges.

The propriety of fixing by law any general or standard specifications is doubted, and it is thought that it would be better to leave such matters to the judgment of the state engineers. With full responsibility laid upon him he will be more likely to be duly critical and cautious.

The idea of adopting a scale of minimum charges is not favored, principally for the reason that it will put the action of the clubs in a wrong light. The suggestion that a conference of representatives of engineering societies should be held, and that the St. Louis Club should be represented is favored. This report was adopted as the sense of the club.

Mr. N. W. Eayrs read a paper on the interlocking system of the St. Louis Bridge & Tunnel Railroad, which has been in operation since 1883. An air compressing plant is operated at the east pier of the bridge, and thence is conveyed to three stations, where it is used to operate pumps, which maintain a second system of pipes worked by means of water in the summer and a solution of chloride of calcium in the winter.

Mr. Thomas McMath presented a paper on the Citizens' Cable Railway. This system is 12 miles long, and operated in three sections. The paper gave a description of a variety of types of grips in use and the method of their operation; also a description of the cable itself.

Mr. Wise exhibited a specimen of wood which had been found at depth of 37 ft. in good clay, and was undoubtedly of great antiquity. Mr. Holman showed the bottom of a cast-iron meter which had been buried in the earth for eleven years. It had become so soft as to be easily whittled. It

was suggested that water pipe would be affected in the same manner. The cause of the decay was not explained.

#### National Association of Builders.

The tenth annual convention of this association will be held in the Lecture Hall in the Franklin Institute, in Philadelphia, Feb. 12, 13 and 14. The programme includes a great variety of reports and papers on matters of interest to builders, architects and contractors. Arrangements have been made for reduced passenger rates on all railroads connected with the Central Traffic Association, the Trunk Line Association and the Southern Passenger Association.

#### The Engineers' Club.

The first annual meeting of the club was held last Tuesday evening, Jan. 15. The meeting was called to order at 9 o'clock, Vice-President Henry R. Towne in the chair. There were between 50 and 60 members present.

Mr. Towne stated briefly the objects of the club and the business of the meeting, and announced that the election of officers would be deferred till a later meeting.

Resolutions offered by Dr. Egleston were adopted, continuing the present Board in control until the next meeting, and authorizing the Board to provide suitable quarters for the club. There was some informal discussion on the location of the club-house. Mr. Williams, the Secretary, read a list of the gentlemen already members, and announced that a number of others had signified their wish to join the club.

#### PERSONAL.

—Mr. N. B. Chandler, of Nashua, N. H., Roadmaster on the Worcester & Nashua division of the Boston & Maine, died at Grafton, Mass., recently, at the age of 67 years.

—Mr. C. W. Davenport has been elected Chairman of the Erie Car Works, Limited, of Erie, Pa., in place of his father, W. R. Davenport, who recently died. The new Chairman has been connected with his father in this concern for many years.

—Mr. John L. G. Charlton, General Passenger Agent of the Mobile & Ohio, has tendered his resignation, to take effect Feb. 1. Mr. Charlton was for five years, to October, 1886, Assistant General Ticket Agent of the Missouri Pacific and Wabash, St. Louis & Pacific.

—Mr. James M. Buckley, Assistant General Manager of the Western Division of the Northern Pacific, has tendered his resignation, and his duties will be hereafter performed by Second Vice-President C. H. Prescott. Mr. Buckley has held this position for six years, and was previously Assistant Manager of the Oregon Railway & Navigation Co.'s lines.

—Mr. Clem Hackney, who has been Superintendent of Machinery of the Union Pacific for the last three years, has resigned that position and is succeeded by Mr. George W. Cushing, who last July resigned the position of Superintendent of Motive Power and Rolling Equipment of the Philadelphia & Reading. Before his connection with the Union Pacific Mr. Hackney was for seven years Assistant Superintendent of Machinery of the Atchison, Topeka & Santa Fe. Mr. Cushing for five years previous to April, 1887, was Superintendent of Motive Power on the Northern Pacific.

#### ELECTIONS AND APPOINTMENTS.

*Atlanta & Danville.*—W. H. Pettibone, recently General Manager of the San Francisco, Clear Lake & Humboldt, in California, has accepted the position of Assistant General Manager of this road, headquarters at Norfolk, Va.

*Atlantic & Pacific.*—D. B. Robinson has been appointed Assistant General Manager of the road, with headquarters at Boston.

Samuel M. Rowe has been appointed Chief Engineer of the western division, with headquarters at Albuquerque, New Mexico.

*Augusta & Savannah.*—The new directory is as follows: A. L. Hartridge, A. R. Lawton, George S. Owens, John L. Hardie, W. S. Lawton, Ferdinand Phineas, Frank H. Miller. A. R. Lawton has been chosen President, and John M. Hogan, Secretary.

*Baltimore & Ohio.*—C. S. Phillips has been appointed Chief Dispatcher and Division Chief Operator of the Chicago division, with headquarters at Garrett, Ind., vice C. P. Wilcox, resigned.

The President has appointed William H. Blackford, Auditor H. Miller and J. Wilcox Brown to fill the vacancies on the special investigating committee.

*Bell's Gap.*—Directors have been elected as follows: President, Charles F. Berwind; Directors, J. H. Converse, H. S. Frank, Aaron Fries, Stephen Green, Samuel G. Lewis and John Reilly.

*Brooklyn Elevated.*—The company has elected these officers: H. W. Putnam, President; Elbert Snedeker, Vice-President; Stephen Pettus, Secretary and Treasurer; J. W. W. Mitchell, Assistant Secretary; Frederick Martin, General Manager; O. F. Nichols, Chief Engineer; W. B. Longyear, Auditor.

*Buffalo & Williamsville.*—At the annual meeting of the stockholders of the company, held in Buffalo last week, the following directors were elected: J. Tillinghast, B. J. Tillman, J. S. Buell, George Urban, Charles Berrick, F. D. Stow, E. S. Turner, T. M. Johnson, Ensign Bennett, Leonard Dodge, C. C. Pickering, A. H. Roudebush and N. P. Stanton. The directors elected these officers: President, B. J. Tillman; Vice-President, F. D. Stow; Secretary, A. H. Roudebush; Treasurer, F. M. Johnson.

*Cambridgeshire & Cleared.*—The following are the directors elected this week: J. W. DuBarry, President; John P. Green, Amos R. Little, Wistar Morris, Samuel Rea, N. Parker Shortridge and Henry D. Welsh.

*Central of Georgia.*—J. G. Robertson, Auditor of Receipts, has been appointed Paymaster in place of R. E. Mims, who will be made Auditor of Receipts, with office in Savannah, Ga.

*Chester Creek.*—The stockholders of the road have re-elected Samuel M. Felton President and these directors: Amos Gartsdie, Thomas Appleby, Eben F. Barker, Richard Peters, Jr., J. N. DuBarry. The latter was elected in place of Charles L. Warner, resigned.

*Chicago & Atlantic.*—John Black, of Lima, O., formerly Master Mechanic of the Cincinnati, Hamilton & Dayton, has been appointed Master Mechanic of this road, with headquarters at Huntington, Ind.

*Chicago, Milwaukee & St. Paul.*—W. T. Allen has been appointed Acting Traffic Agent in charge of passenger and freight interests in California and Nevada, vice Charles E.

Fairbank, deceased. Mr. Allen's office will be at 138 Montgomery street, San Francisco, Cal.

*Chicago, St. Paul & Kansas City.*—The duties of H. Fernstrom, Engineer in Chief, have been enlarged by the addition of those of Engineer of Maintenance of Way. S. C. Stickney, formerly Engineer of Maintenance of Way, has been appointed Assistant to the President.

*Chicago & Western Indiana.*—J. M. Ranney has been appointed Master of Transportation, with headquarters at Chicago, Ill.

*Clearfield & Jefferson.*—The following directors were this week chosen: President, Aeron Fries; directors, Chas. F. Berwind, J. H. Converse, H. S. Frank, S. G. Lewis, F. S. Lewis and John Reilly.

*Columbus, Hocking Valley & Toledo.*—The following are the directors elected at the recent annual meeting in Columbus, Ohio: John Newell and D. W. Caldwell, of Cleveland; Jay O. Moss, of Sandusky; H. D. Terrell, of New York; Charles B. Alexander, John W. Shaw and W. P. Shaw, of Columbus.

*Covington & Cincinnati Elevated Railroad & Transfer Co.*—The stockholders have elected the following directors: M. E. Ingalls and H. E. Huntington, of Cincinnati; F. A. Prague, I. G. Rawl and L. Hood, of Covington, Ky.; C. H. Coster, C. P. Huntington, A. J. Thomas and R. J. Cross, of New York. The directors organized by electing M. E. Ingalls President, vice M. E. Gates; C. H. Coster, Vice-President, and J. C. Davie, Secretary and Treasurer.

*Covington & Macon.*—A. C. Palmer having resigned the position of General Passenger Agent, A. G. Craig, General Freight Agent, has assumed the duties of that office.

*Davenport, Iowa & Dakota.*—The officers of the company are: President, James T. Lane; Secretary, H. C. Fulton; Treasurer, J. R. Lane, Chief Engineer, A. L. Stannard. The general office is at Davenport, Ia.

*Deer Creek & Susquehanna.*—The following officers were recently elected: George M. Jewett, President, and W. Beatty Harlan, Secretary and Treasurer, with office at Belair, Md. The following board of directors were re-elected: George M. Jewett, S. A. Williams, W. Beatty Harlan, D. C. W. Smith, Benjamin Silver, Jr., George E. Silver and John H. Janney.

*Delaware.*—The annual meeting of the stockholders was held in Dover, Del., Jan. 9, and the following directors were elected for the ensuing year: S. M. Felton, George B. Roberts, George Gray, E. T. Warner, Christian Feigler, J. N. DuBarry, Joseph R. Whitaker, Manlove Hayes, Alexander Johnson, James J. Ross, Thomas Curry, J. Turpin Moor and Cornelius J. Hall.

*Duluth, South Shore & Atlantic.*—Ernest Rankin, has been appointed Acting General Passenger and Ticket Agent, with headquarters at Marquette, Mich., to succeed S. F. Boyd, resigned.

*Escanaba, Twin City & Western.*—The officers of this proposed road are Marcus Pollasky President, Lieut.-Governor McDonald Treasurer, and George A. Royce, of Marquette, Secretary.

*Fairhaven & Southern.*—Nelson Bennett, C. M. Wilson, E. L. Cougill, of Tacoma; and S. E. Larabee and C. H. Larabee, of Montana, are the incorporators of this line.

*Hartford & Connecticut Western.*—The following appointments have been made: S. B. Opdyke, Jr., General Superintendent, vice E. McNeil, resigned; Walter Pearce, General Freight and Passenger Agent; H. W. Watson, Auditor, and R. P. Martin, Division Superintendent, with office at Hartford, Conn.

*Henderson Bridge Co.*—The newly elected directors are: M. H. Smith, A. M. Quarrier, C. Quarrier, S. H. Edgar, Dennis Long, W. C. Hall and H. W. Bruce. The officers are: M. H. Smith, President; H. W. Bruce, Attorney; C. Montfort, Chief Engineer; S. S. Eastwood, Secretary and Treasurer.

*Heresford.*—The officers of the company are as follows: William Sawyer, President; W. B. Ives, M. P. Treasurer; George Van Dyke, Manager; Hon. Irving W. Drew, Auditor. General offices at Cookshire, P. Q.

*Iowa Railroad Commission.*—The Commissioners have drawn the lots to determine the length of their respective terms of office. The following are the terms drawn: F. T. Campbell, three years; Peter A. Dey, two years, and Spencer Smith, one year. Mr. Dey was re-elected President and W. W. Ainsworth Secretary.

*Johnsonburg.*—Directors were this week elected as follows: President, J. Bayard Henry; Directors, James Bayard, Geo. Bonnell, Chas. T. Evans, Edgar D. Farles, John J. Henry and Edward D. Toland.

*Kanona & Prattsburgh.*—The officers of this company are: M. Pinney, President; T. Van Tuyle, Vice-President; A. K. Smith, Treasurer; J. K. Smith, Secretary; J. G. Baker, Chief Engineer. The general office is at Prattsburgh, N. Y.

*Kansas City, St. Joseph & Council Bluffs.*—George B. Dunbar has been appointed Assistant General Passenger and Ticket Agent, with headquarters at St. Joseph, Mo.

*Kansas City Union Depot Co.*—The board of directors has elected George H. Nettleton, President; E. P. Ripley, Auditor; Executive Committee composed of George H. Netleton, W. F. Merrill and A. A. Robinson.

*Lehigh & Lackawanna.*—The company has elected the following directors: President, F. C. Yarnall; Directors, J. S. Harris, E. W. Clark, Edward Lewis, S. Shepherd

*Lehigh Valley.*—At the annual meeting held in Philadelphia, Jan. 15, the old officers were re-elected as follows: President, Elisha P. Wilbur; First Vice President, Charles Hartshorne; Second Vice-President, Robert H. Sayre; Third Vice-President, John B. Garrett; Treasurer, William C. Andrew; Secretary, John P. Lanshaw; Assistant Secretary, Isaac W. Morris; Directors, Charles Hartshorne, William Conyngham, Ario Pardee, William A. Ingham, Robert H. Sayre, James L. Blaklee, John R. Fell, Robert R. Lamberton, John B. Garrett, Charles O. Skeer, William Brockle and Calvin Farde.

*Los Angeles, Utah & Atlantic.*—J. M. C. Marble, formerly President of the Cincinnati, Jackson & Mackinaw, is now President of this California company.

*Loyalsock.*—The directors elected this week are: E. P. Wilbur, President; William C. Alderson, John R. Fanshawe, Henry S. Drinker, William Stevenson and J. Raymond Claghorn.

*Michigan Railroad Commission.*—John T. Rich has been re-appointed Commissioner of Railroads of the state of Michigan for the term commencing Jan. 1, 1889. Wyllys C. Ransom has been re-appointed Deputy Commissioner of

Railroads, and Clinton B. Conger has been reappointed Mechanical Engineer.

*Mine Hill & Schuylkill Haven.*—The annual election held this week resulted as follows: President, Benjamin H. Shoemaker; Managers, Frederick Fraley, John W. Biddle, William Hacker, Alfred Jones, Josiah Jones, James G. McCollin, Barclay R. Leeds, Philip C. Garrett, Thomas McKean, Redwood F. Warner.

*Minneapolis, St. Paul & Superior.*—The directors of this new road are: James Bardon and E. L. Johnson, of Superior, Wis.; J. S. Barker, St. Croix Falls; Isaac Staples, Stillwater, and William G. Robertson, St. Paul.

*Mississippi River & Mexican Gulf.*—The following are the officers of the company: John P. Richardson, President; William Oliver, Vice-President; Luther Sexton, Secretary and General Manager; and James S. Rea, Treasurer.

*Mobile, Jackson & Kansas City.*—T. W. Nicol, of Mobile, Ala., has been appointed Chief Engineer.

*Montreal, Portland & Boston.*—The annual meeting of the company was held in Montreal this week and the following were elected directors: George W. Hendee, of Morrisville, Vt.; Bradley B. Smalley, of Burlington, Vt.; J. Cassie Halton, of Montreal; John L. Morris, Queen's Counsel, of Montreal; Col. A. H. Gilmour, of Stanbridge, East; Albert P. Cross, of St. Albans, Vt.; Francis McLennan, of Montreal. At meeting of the directors J. C. Halton was elected President and Col. A. H. Gilmour Vice-President.

*Nashville & West Nashville.*—The new directors elected are: H. W. Buttorff, B. F. Wilson, R. D. Goodall, L. H. Davis, John Woodward, M. S. Cockrill, E. T. Holman, Dr. T. Menees, J. M. Head, R. L. Morris and J. H. Yarbrough. The officers are: L. H. Davis, President; M. S. Cockrill, Vice-President; B. F. Wilson, Treasurer; Charles Davidson, Secretary, and T. R. Donahue, General Manager.

*Nebraska, Kansas & Colorado.*—The officers of this new company are: S. O. Wanzer, of Hoxie, President; Isaac Mulholland, of Hoxie, Secretary; John J. Cass, of Allison, Treasurer. The directors are: Thomas Kimball, of Omaha; David D. Hoag, of Kansas City, Kan.; J. Jensen, of Geneva, Neb.; J. J. Cass, of Allison; Isaac Mulholland and S. O. Wanzer, of Hoxie; Charles R. Stevenson, of Russell Springs; J. E. Siefke, of New Almedo, and E. Jameson, of Lonona.

*Nesquehoning Valley.*—Directors have been elected as follows: President, J. B. Moorehead; Directors, F. R. Cope, J. W. Woolston, W. P. Cresson, I. V. Williamson, W. C. Ludwig, J. S. Harris, E. W. Clark, P. C. Garrett, T. C. Henry, F. C. Yarnall, Edward Lewis, S. Dickson.

*Newport News & Mississippi Valley.*—W. E. Riley has been appointed Traveling Passenger Agent in charge of all territory along the Western Division, with headquarters at Louisville, Ky.

*New York, Chicago & St. Louis.*—Albert W. Johnston has been appointed Superintendent of the Eastern Division of the road, with office at Cleveland, O., to succeed G. H. Kimball, resigned.

*New York, Lake Erie & Western.*—T. W. Ransom has been appointed Master Mechanic of the Western Division in place of J. Hawthorne, resigned. Headquarters at Hornellsburg, N. Y. Joseph H. Moore has been appointed Master Mechanic of the Delaware Division in place of T. W. Ransom, transferred. Headquarters at Port Jervis.

Ross Kells has been appointed Superintendent of Motive Power, with headquarters at New York City, vice Mr. J. W. Cloud, resigned.

Charles Davis has been appointed Road Foreman of Engines on the Buffalo division.

*New York, Ontario & Western.*—The annual meeting was held in New York, Jan. 16, and the following directors were elected: Thomas P. Fowler, Charles S. Whelan, Charles John Russell, Joseph Price, Harry Pearson, John Greenough, Francis R. Culbert, Albert S. Roe, Samuel Barton, Richard Irvin, Jr., Wm. H. Paulding, Ebenezer S. Stile, Julien L. Myers. The board of directors elected Thomas P. Fowler President, and John Barton Secretary and Treasurer. John B. Kerr was re-appointed General Counsel of the company, and James E. Childs General Manager. The stockholders elected E. H. Sewell Auditor.

*Northeast Pennsylvania.*—The company has elected the following directors: President, Edward C. Knight; Directors, John Jordan, Jr., William C. Ludwig, Ario Pardee, James H. Stevenson, Richard J. Dobbins, Charles A. Sparks, G. J. Mitchell, Isaac Warner, Jr., I. Newton Evans, Samuel S. Thompson, Edward C. Knight, Jr., Chas. H. R. Treble and John R. Fell.

*North Pennsylvania.*—The following directors have been elected: President, Edward C. Knight; Directors, John Jordan, Jr., William C. Ludwig, Ario Pardee, James H. Stevenson, Richard J. Dobbins, Charles A. Sparks, G. J. Mitchell, Isaac Warner, Jr., I. Newton Evans, Samuel S. Thompson, Edward C. Knight, Jr., Chas. H. R. Treble and John R. Fell.

*Norwich & Worcester.*—George H. Ball, of Boston, has been chosen President of the road, vice E. L. Davis, of Worcester, declined.

*Orange Belt.*—J. N. Finney has been appointed Superintendent of Transportation, with headquarters at Oakland, Fla.

*Paducah, Hickman & Southern.*—At the recent annual meeting held at Paducah, Ky., the following directors were elected: C. L. Randle, E. O. Reid, R. S. Murrell, J. M. Ringo, Chas. Reed, Henry H. Houston, W. F. Bradshaw, Ed. Farley, H. Mulholland, Jr. The directors organized as follows: C. L. Randle, President; E. Farley, Vice-President; E. O. Reid, Treasurer; W. F. Paxton, Secretary. All are of Paducah.

*Pennsylvania & New York Canal & Railroad Co.*—The officers elected at the annual meeting, held this week, are: President, Elisha P. Wilbur; Directors, Charles Hartshorne, William Stevenson, Robert H. Sayre, Victor E. Piollet, William H. Sayre, Robert Lockhart, James S. Blaklee, Howard Elmer, John B. Garrett, Robert Lamerton, William Brockie and Albert Lewis.

*Philadelphia & Baltimore Central.*—At the annual meeting of the stockholders of the company, held in Philadelphia, Pa., the following officers were elected: President, George B. Roberts; Secretary and Treasurer, Robert Craven; Directors, G. B. Roberts, J. N. Du Barry, N. Parker Shortridge, Samuel R. Dickey, Joseph R. Martin, S. D. Ramsey, State Director, R. R. Crothers.

*Philadelphia & Reading.*—These officers were elected for the ensuing year at the annual meeting of the company, held in Philadelphia, Jan. 14: President, Austin Corbin; Managers, A. J. Antelo, Samuel R. Shipley, Thomas Cochran, George DeB. Keim, Stephen A. Caldwell, George F.

Baer: Treasurer, William A. Church; Secretary, William R. Taylor.

The Reading & Columbia, East Pennsylvania, Shamokin, Sunbury & Lewisburg, Chester & Delaware River, and the East Mahanoy railroads, all controlled by the Philadelphia & Reading, held annual meetings on the same day, and elected Austin Corbin President, and the Reading board of directors.

The office of Mr. L. B. Paxson, Superintendent of Motive Power and Rolling Equipment, is at Reading, Pa., instead of Philadelphia, as stated in this column last week.

**Philadelphia & Reading Coal & Iron Co.**—At the annual meeting of the company held in Philadelphia, Jan. 14, the following were elected: President, George DeB. Keim; Directors, Austin Corbin, S. P. Wolverton, W. G. Audenreid, George F. Baer, H. A. Dupont, A. A. McLeod; Treasurer, W. A. Church; Secretary, F. F. Kaercher.

**Portland & Ogdensburg.**—At the annual meeting of the road the following directors were chosen: S. J. Anderson, W. F. Milliken, Frank Jones, F. N. Doud, Charles J. Chapman, Arthur Sewall, S. R. Small, H. N. Jose, Francis Fesenden and Thomas P. Shaw.

**Reading & Columbia.**—The following have been elected directors: Austin Corbin, President; George DeB. Keim, S. A. Caldwell, A. A. McLeod, Thomas Cochran, J. J. Antelo, George F. Baer, J. N. Hutchinson, Thomas Baumgardner, William Latimer Small, Benjamin F. Hiestand, Paris Halldeman, Adam R. Reyer, Secretary; Howard Hancock, Treasurer; John Welsh.

**St. Louis & Chicago.**—Robert J. Cavett, Receiver, has appointed H. Bosworth Auditor and General Freight and Passenger Agent, in place of A. J. Moorshead. L. S. Graves, Superintendent, has resigned, and the Receiver has assumed the duties of that office.

**Sandusky, Mansfield & Newark.**—The annual meeting of the stockholders of the company was held at Sandusky, O., Jan. 16, and the following directors were elected: John Gardiner, Jay O. Moss, Clark Rude, Charles H. Moss, L. I. Tracy, A. C. Moss, Charles F. Mayer and Robert Garrett.

**Silver Lake.**—At the annual meeting of the stockholders of the company, held in Rochester this week, the following named directors were elected: Arthur G. Yates, R. T. Tuttle, H. N. Page, C. W. G. Nobles, M. H. Ohl, E. M. Read, James Wyckoff, H. H. Warner, W. L. Kingman, C. H. Blakeslee, George E. Merchant, Earl B. Putnam, J. Lansing Moore.

**Syracuse & Baldwinsville.**—At the recent annual meeting the following directors were elected: J. T. Skinner, Jefferson M. Levy, J. Frazee, Jacob Amos, T. C. Delavan, C. M. Sweet, R. A. Dorman, Frank C. Hollins, W. R. Lamberton, E. C. Gregory, W. C. Andrews, D. M. Henderson, Philip K. Green.

**Terre Haute & Indianapolis.**—At a meeting of directors last week W. R. McLean was re-elected President. The other officers were also re-elected.

**Texas & Pacific.**—E. H. Hinton, Assistant General Freight Agent, has been appointed General Freight Agent, with office at Dallas, Tex., in place of W. W. Finley, resigned.

**Treskow.**—At the recent annual meeting directors were chosen, as follows: President, F. C. Yarnall; Directors, J. S. Harris, E. W. Clark, Edward Lewis, T. C. Henry, E. Hill, C. F. Howell.

**Turtle Creek Valley.**—The following directors have been chosen: John N. DuBarry, President; Robert Pitcairn, Henry D. Welsh, John P. Green, Samuel Rea, W. H. Barnes, N. P. Sherridge.

**Union Pacific.**—George W. Cushing has been appointed Superintendent of Machinery, with office at Omaha, Neb., to succeed Clem. Hackney, resigned. Appointment takes effect Feb. 1.

At a meeting of the directors this week Edwin F. Atkins was elected a director in the place of Eliisa Attkius, deceased; J. P. Spaulding in place of M. D. Spaulding; and J. H. Millard, of Omaha, in place of Ezra H. Baker.

**Virginia, Parkersburgh & Ohio.**—The following officers have been elected: Perry G. Marshall, of Zanesville, O., President; Gideon E. Meigs of Painesville, O.; E. T. Singer, of Chicago, and Cary W. Kauke, of Wooster, O., Vice-Presidents; Frank N. Wedge, of Zanesville, Treasurer; Rufus C. Burton, of Zanesville, Secretary; Henry A. Leslie, Auditor; Gilbert F. Axline, Assistant Treasurer; B. Eban Cutler, Chief Engineer; Claude V. Martin, Assistant Engineer, and Albert E. Boone, of Zanesville, General Manager.

**Western New York & Pennsylvania.**—The following directors were elected at the annual meeting held in Philadelphia Jan. 14: Calvin H. Allen, Samuel G. DeCoursey, Edward L. Owen, John D. Probst, Adolph Engier, William T. Tiers, George E. Bartol, E. W. Clark, Jr.; Carl Schurz, Gustav E. Kissel, Isaac N. Seligman, Arnold Marcus, Pascal P. Pratt.

**Western Railroad Association.**—The annual meeting of the association was held last week and the following officers and directors were elected: President, B. F. Ayer; Secretary, C. R. Babeuf, General Counsel and Treasurer, George Payson. Directors, B. F. Ayer, H. B. Stone, B. C. Cook, John B. Carson, A. L. Osborn, T. F. Witherow, J. C. McMullan, John Newell, H. H. Poppleton, Roswell Miller, W. H. Holcomb and J. F. Goddard.

**Wilkesbarre & Scranton.**—At the recent annual meeting the following were elected directors: President, J. S. Harris; Directors, F. C. Yarnall, F. R. Cope, S. Shepherd, E. Hill, C. F. Howell, W. A. Buchanan.

**Wind Gap & Delaware.**—The following directors were this week elected: President, F. C. Yarnall; Directors, J. S. Harris, Edward Lewis, S. Shepherd, E. Hill, E. W. Clark, Jr., C. F. Howell.

#### OLD AND NEW ROADS.

**Atchison, Topeka & Santa Fe.**—The directors at their meeting this week voted not to declare the usual quarterly dividend.

**Baltimore & Ohio.**—A large force of men were this week set at work by the company on the new line across the city of Philadelphia to connect with the Philadelphia & Reading near Wayne Junction. It has been decided that the Baltimore & Ohio will go under the Philadelphia & Reading tracks at Pennsylvania avenue. Surveys for the tunnel are now being made. The line will run nearly parallel to the Pennsylvania connecting railroad.

**Bangor & Piscataquis.**—The directors have decided to have a survey and estimates made for a proposed extension from Oldtown to tidewater at Bangor, Me., a distance of about 12 miles.

**Bells Gap.**—The company is said to be considering plans

of an extension of its road into Jefferson City, Pa., to develop the new coal and lumber districts.

**Canadian Pacific.**—The company has decided to let the contracts for building the Detroit extension of the Ontario & Quebec road this winter, instead of waiting for the spring, as was thought would be done. The line will be about 110 miles long, extending from London to Windsor, Ont., opposite Detroit. A force of men is now at work on the road near Windsor under direction of the company's officers. Proposals for building the line will be received until Jan. 26.

This company is applying for an act enabling it to readjust and consolidate the capital charges upon its entire system, without increasing the annual charges thereon, and to make further provisions for steamship plant and equipment.

**Chesapeake & Nashville.**—Mercer County, Ky., has voted a subscription of \$125,000 to this company, which, in addition to the heretofore published route, proposes now to extend its line from Harrodsburg, Mercer County, Ky., to Springfield, in Washington County, where a connection would be made with the Louisville & Nashville.

**Chicago & Atlantic.**—The suit against the Chicago & Atlantic, in which the Farmers' Loan & Trust Co., of New York, the New York, Lake Erie & Western and the first and second mortgage bondholders are interested, has been decided against the Chicago & Atlantic. Judge Gresham has directed that the mortgages be foreclosed and the property sold. The first mortgage is for \$6,500,000, with the Farmers' Loan & Trust Co. as trustee. The second mortgage is for \$5,000,000, and the bonds were issued under an agreement between the New York, Lake Erie & Western and the Chicago & Atlantic, which provided that those bonds should be held by Hugh J. Jewett, who was then President of both corporations, in trust and as security for advances made and to be made by the Erie on account of the Chicago & Atlantic.

**Chicago & Northwestern.**—A reconnaissance is being made for a proposed line from Janesville, southeasterly to Lake Geneva, about 35 miles.

**Chicago, Rock Island & Pacific.**—Articles of consolidation of the Chicago, Rock Island & Pacific, Atlantic & Southern, Avoca, Macedonia & Southwestern, and Atlantic & Audubon roads have been filed in Kansas under the above name. This consolidation does not include the Chicago, Kansas & Nebraska, which will still be operated as a separate road and under a separate name.

**Cincinnati, Washington & Baltimore.**—In the suit for a Receiver for this road the Baltimore & Ohio has filed an answer and cross-petition, setting up the judgment rendered in its favor for \$1,220,397 against the Cincinnati, Washington & Baltimore, and asking that this judgment be declared a lien prior to all the mortgages and deeds of trust executed by the Cincinnati, Washington & Baltimore to the plaintiffs; that the road be sold, and that this lien be first paid out of the proceeds.

**Deer Creek & Susquehanna.**—The contract for building this road from Belair, Md., on the Maryland Central easterly, to Stafford, Md., on the Susquehanna River, a distance of 16 miles, has been sublet to L. B. McCabe & Bro., of Port Deposit, Md., by J. H. Miller, of Pittsburgh. Grading will probably be commenced next month, and the road is to be completed by Sept. 15. A mortgage for \$300,000 has been made to secure the issue of bonds.

**Davenport, Iowa & Dakota.**—About 100 miles of this road are reported graded, and 30 miles of track has been laid from Davenport to a connection with the Burlington, Cedar Rapids & Northern in Cedar County. The line has been located from Davenport via Anamosa, Ia., northwesterly toward Big Stone Lake, Dakota, for a distance of 250 miles. Williams & Flynn, of Independence, Ia., have the contract. Bonds have been issued at the rate of \$16,000 per mile, and the contractors are paid with these bonds. A. L. Starnard is Chief Engineer.

**Denver, South Park & Pacific.**—At a recent meeting of the stockholders a permanent committee was appointed to proceed with the foreclosure of the road, and its reorganization under the scheme presented by the temporary committee, which will be published soon. The committee consists of F. D. Tappan, W. H. Hellister and Francis LeLand.

**Dexter & Piscataquis.**—Brown Bros., of St. Stephens, N. B., have been awarded the contract for building this road from Dexter to Foxcroft, Me., a distance of 16 miles. The line is to be completed by Nov. 1, 1889. J. B. Mayo, Foxcroft, Me., is President.

**Eufaula & St. Andrews.**—This project, of which W. H. Reeves, of Eufaula, Ala., is President, though still in abeyance, has not been abandoned, and it is stated that the President is making preliminary arrangements for beginning the work.

**Evansville & Mt. Carmel.**—Articles of incorporation have been filed authorizing the building of this road, to extend from Evansville, Ind., to Mt. Carmel, Ill., by a route to be decided by surveys to be made at once.

**Fairhaven & Southern.**—This is the name that has been adopted for the road which Nelson Bennett recently agreed to build. The line is to extend from some point on Bellingham Bay in the County of Whatcom, Wash. Ter., to a point on the Columbia River in the Territory of Washington, with branches from this line, either eastwardly or westwardly, as may be decided. The capital stock is \$1,000,000.

**Fitchburg.**—Suit has been brought at Boston, in the Superior Court, by the state against the Fitchburg, for \$75,000 and interest, which it is alleged is due the Commonwealth for rental of the Southern Vermont railroad.

**Georgia.**—Bills introduced in the legislature to incorporate the following railroad companies have become laws: Fairmont & Augusta, Macon & Birmingham, Mountain Valley, the Georgia Overland Railroad & Improvement Co., Millen, Mt. Vernon & Florida and the Acoochee Valley roads.

**Great Northwest Central.**—The President of this road denies that the company will seek amendments to the charter this session of Parliament. The time for completing the road expires in January, 1890, by which time it is expected the work of construction will be finished. The road has been graded for 50 miles from Brandon, and the President says their steel rails will arrive on the opening of navigation of the St. Lawrence in the coming spring.

**Housatonic.**—The Connecticut Railroad Commissioners have made a favorable recommendation to the Legislature on the company's application for an increase of capital stock. The road asked leave to increase its stock \$4,500,000 for new branches, double-tracking, etc. The capital of the roads leased by the Housatonic is \$2,508,000. The Commissioners express the opinion that it is better to raise the funds by a stock issue than by the sale of bonds, and recommend that a stock issue be authorized sufficient to pay the road's indebtedness, the cost of the proposed branches and of additional

tracks, and of buying the stock and bonds of leased lines. The Commissioners recommend restrictions upon the stock issue identical with those noted for the New York, New Haven & Hartford.

**Indianapolis, Decatur & Western.**—President Hammond announces that by spring the work of extending the line westward from Decatur, Ill., will be commenced. The road will pass through Beardstown to Quincy, where it will connect with the Quincy, Omaha & Kansas City, giving a new line between Indianapolis and Kansas City.

**Jackson & Middleton.**—The surveying and other work on this road has been temporarily suspended. It is a line intended to be built from Jackson, Tenn., to Middleton, Tenn., the terminus of the Gulf & Ship Island road. The charter is held by citizens of Jackson. Col. John Hamilton, General Manager of the Gulf & Ship Island, is in charge of the new road, and when completed that company will operate it.

**Kanona & Prattsburgh.**—About nine miles of this road is graded between Kanona and Prattsburgh, N. Y., and tracklaying will be commenced this week. The contract has been let to W. L. Williams, of Syracuse, N. Y. The rails and ties are now being delivered, and the funds for constructing and equipping the line have been fully provided for. The road will extend from Kanona up Five Mile Creek to Prattsburgh, N. Y., a distance of 12 miles.

**Kansas City, Des Moines & St. Paul.**—It is stated that a reconnaissance has been made for this road for part of the distance between Des Moines and St. Paul, by Thomas Bowes of Minneapolis.

**Kinderhook & Hudson.**—The company has filed articles of incorporation in New York to build a road from Hudson, N. Y., northeasterly to Kinderhook, on the main line of the Boston & Albany, running through the villages of Stoltville, Stockport, Stuyvesant Falls and Valatie, a distance of about 16 miles. The capital stock is \$170,000.

**Knoxville Southern.**—It is stated that the contracts have been let for completing this road to the connection near the Georgia state line with the Marietta & North Georgia road. The contracts for about 25 miles from Knoxville south to the Little Tennessee River have been let for some time, and of this, about 15 miles is completed.

**Lehigh Valley.**—The annual meeting was held in Philadelphia, Jan. 14. The income from all sources, including interest received from investments, etc., was \$12,353,739, operating expenses, \$7,125,234, leaving \$5,225,504. Interest on bonds amounted to \$2,081,284; dividends, to \$1,890,876, and \$907,873 was paid out for general expenses, including the loss by the Mud Run disaster. The surplus, after these expenditures, amounted to \$255,470. The report refers to the new stock issued to provide for various improvements and extensions, which was offered at par to the stockholders to an amount equal to 20 per cent. of their holdings. Of the 130,531 shares thus issued all but 4,324 shares were taken. In addition to 22 locomotives and over 2,500 eight-wheel cars added to the rolling stock during the year 10 additional locomotives and 2,000 coal gondola cars have been ordered. The mountain cut off road recently completed, extending from Fairview to the Pleasant Valley Branch, a distance of 16 miles, reduces the distance six miles and the grade from 96 to 64 ft. With reference to improvements in Jersey City, referred to last week, the report says: One pier for transfer of cars to floats is nearly completed and four others, each 550 ft. long and 100 ft. wide, with 100 ft. width of water-way, are well advanced, one being already in use. The plans contemplate the building of nine other piers, as business may require. Beside this, considerable dredging and a large amount of filling for tracks and yard room have been done and several miles of tracks have been laid. More than \$500,000 has already been expended on this work.

**Lincoln Park & Charlotte.**—The company proposes to authorize an issue of \$350,000 bonds secured by a mortgage on the road. A stockholders' meeting to consider the question will be held in New York city Feb. 13. At this meeting the proposition to lease the road to the Buffalo, Rochester & Pittsburgh will also be considered.

**Long Island.**—The company this week made application to the New York State Railroad Commission for permission to increase its capital stock from \$10,000,000 to \$12,000,000.

**Louisville, St. Louis & Texas.**—The line from Owensboro to Henderson, Ky., a distance of 35 miles, has been opened for traffic. This makes the entire line open from Louisville, Ky., to Henderson, Ky., 147 miles.

**Mason City & Fort Dodge.**—The company has defaulted on the interest of its bonds, which are held by the New England Loan & Trust Co. The company holds bonds for \$2,250,000, secured by mortgage.

**Mataine.**—This company is applying for a charter from the Quebec Legislature giving it power to construct a line of road from a point at or near St. Octave de Metis, in Riomouski County, to Gaspe.

**Minneapolis, St. Paul & Superior.**—Charter filed in Wisconsin to build a road from Superior to St. Croix Falls, 90 miles; also southerly to a point near the line between Wisconsin and Minnesota, in Polk County. The capital stock is \$2,000,000.

**Missouri Pacific.**—The branch from Ft. Smith southeast to Greenwood, Ark., about 18 miles, has been completed and transferred to the operating department. The company has been asked to extend the line to Huntington, in Sebastian County, and also southeast about 30 miles to Waldron, in Scott County.

**Montgomery & Sylacauga.**—This is a line projected to extend from Montgomery through Rockford to Sylacauga, Ala., 60 miles, and it is thought that construction will begin early next Spring. B. K. Collier, of Montgomery, Ala., is President.

**New Roads.**—A somewhat indefinite statement is published that "capitalists" in Michigan, Ohio, West Virginia and Pennsylvania are about to secure a charter for a road from some point on Lake Michigan, through Ohio to the Ohio River, thence to Washington, Pa., and the Connellsburg coke region.

**New York & Boston Inland.**—Treasurer Thayer, of this company, in applying to the Railroad Committee of the Massachusetts Legislature for an extension of time in which to complete the road, stated this week that the company had expended \$175,000 in Massachusetts and \$200,000 in New York. It was also stated that contracts had just been let for the building of 40 miles of road in Connecticut west of New Haven.

**New York, New Haven & Hartford.**—The Connecticut Railroad Commissioners this week made a favorable recommendation to the Legislature on the proposed increase of the capital stock of the company. The present capital

stock is \$15,500,000; the funded debt \$2,000,000; the floating debt on Sept. 30, 1888, was \$1,960,740.99, and is now about \$2,500,000, most of it contracted in making improvements and in building the quadruple track; the stock and bonds of the leased roads are \$18,062,000, on which rentals of \$940,000 per annum are paid, averaging 5 per cent. To exchange this for stock of this company would require \$12,500,000 of new stock, which, with the present stock and debt, would make about \$33,000,000. The cost of additional four-tracking will be \$8,000,000, and abolishing grade crossings will cost a large amount. The Commissioners recommend that the company be authorized to increase its capital stock for the above-named purposes to whatever amount is necessary, the stock to be issued at par; that the present stockholders be given an opportunity to take the new stock; that stock not taken may be taken by the other stockholders; that new stock shall not be issued in excess of the costs of the improvements; that all stock issues must be approved by a two-thirds vote of the stockholders, and that issues of stock in exchange for the stock of leased roads shall not exceed the total par value of the stock of such roads.

A bill authorizing the issue has been introduced in the Legislature with restrictions similar to those recommended by the Commissioners.

**New York, Ontario & Western.**—It is stated that surveys are being made for a line from Hancock, N. Y., to the Lackawanna coal fields at Carbondale, Pa., a distance of about 31 miles.

The branch from New Berlin to Edmeston, N. Y., eight miles, will be placed in operation Jan. 15.

**New York, St. Lawrence & Ottawa.**—The engineer of this projected line states that it will be 57½ miles long and 17½ miles shorter than the present Canadian Pacific line between the termini. The road will pass through North Augusta, Burrett's Rapids, North Gower and Jockville, crossing the Jock River at the latter point, entering Ottawa at the terminal point of the Canada Atlantic.

**Northern Pacific & Manitoba.**—The crossing at Fort Whyte, Man., where the Portage extension of the road crosses the Canada Pacific, was effected last week. The crossing was put in by the Canada Pacific men, who tore down the barricade and cleared away the dead engine and other obstructions, thus ending the controversy.

**Ohio & Northwestern.**—A suit has been instituted in Cincinnati by the Philadelphia Investment Co. to recover of the company \$674,000, the face value of 674 bonds of the road. The Investment Co. asks that overdue interest on bonds and coupons to the amount of \$86,000 be awarded them, and as the road has broken the conditions of the mortgage deed given to secure the loan, that all the property of the road be sold to liquidate the claims, unless they are otherwise paid; that the Court order the road to pay the interest due within a certain time, or to order the Receiver to sell the road and apply the proceeds to the payment of interest and all claims; that an order be issued to the Merchants' Trust Co., one of the defendants to deliver to the Investment Co. 41 bonds of a par value of \$41,000.

**Old Colony.**—S. L. Minot, the engineer who has been surveying the new branch road of the Old Colony system from Walpole Centre to North Attleborough, 11½ miles, has completed the survey, and has submitted the plans for the route. The maximum grade is 52 ft. per mile, and there are no grade crossings, the road going either above or below all highways. Work on the line will begin immediately.

**Paducah, Hickman & Southern.**—Hickman, Ky., last week unanimously voted a subscription of \$100,000 to this proposed road, which is the old Paducah & Hickman Railroad project.

**Pennsylvania.**—It is reported that the company has decided upon a plan by which the shipment of freight through Pittsburgh is to be abandoned and the freight yards transferred to Turtle Creek, 12 miles east of Pittsburgh. Through freight will be transferred from Turtle Creek across the Monongahela to the tracks of the Monongahela Division (the Pittsburgh, Virginia & Charleston road), thence west over the latter's tracks to the Pittsburgh, Fort Wayne & Chicago. A large amount of property along the Pittsburgh, Virginia & Charleston, through the south side of Pittsburgh, will be needed; also a bridge over the Ohio, connecting the Panhandle and Fort Wayne roads, from Nimick Station, on the former, to a point near Verner, on the latter. Considerable property has already been purchased, it is reported, and options secured on other pieces.

**Pennsylvania & New York Canal & Railroad Co.**—The annual report says that it has been considered judicious to create a new mortgage by this company for \$10,000,000, at five per cent. interest, running 50 years from April 1, 1889, "by which the bonds may be properly provided for at maturity and the preferred stock with its arrearages retired." This proposed new loan will benefit the Lehigh Valley, which is the owner of all the preferred stock which is to be retired. The preferred stock is entitled to ten per cent. annual dividends, and after paying seven per cent. last year there remained 45 per cent. arrearages of dividends.

**Pennsylvania, Poughkeepsie & Boston.**—The company has secured a conveyance to it of the line of the Pennsylvania, Slatington & New England extending from near Slatington, Pa., to near Pine Island, N. Y.; the consideration is reported to be \$1,750,000 of the capital stock of the corporation. The transfer was made by W. W. Gibbs, President of the latter road, and others.

The company is filing for record in New Jersey a copy of a mortgage for \$1,500,000, made in favor of the Holland Trust Co., of Philadelphia.

**Rockaway Valley.**—The extension of this road to Peacock, in Somerset County, N. Y., in the spring is now assured.

**St. Cloud Sugar Belt.**—Tracklaying is now completed on this road, which extends from Kissimmee through St. Cloud to Runnymede, Fla., 12 miles. The road passes through rich reclaimed lands, well adapted for growing sugar, which is now being extensively cultivated. T. S. Tutwiler is General Superintendent.

**St. Lawrence & Ottawa.**—This company will ask Parliament for power to apply the proceeds of the sale of its lands in improving the property and the redemption of bonds.

**Scioto Valley.**—Three judgments for about \$2,000,000 have been taken in the court at Columbus, O., by attorneys representing C. P. Huntington, Thatcher M. Adams and Edward F. Winslow, of New York, against the company. The judgments were taken in default.

**Southern Pacific.**—The new coast line will probably be opened this or next week from Templeton south to Santa Margarita Ranch, Cal.

**Union Pacific.**—The company has completed arrangements to enter Sioux City, Iowa, over the tracks of the Chica-

go, St. Paul, Minneapolis & Omaha road, connecting with the latter road at Norfolk, Neb.

**Virginia, Parkersburg & Ohio.**—The stockholders of this company, which is to form the seaboard division of Col. Boone's "Diamond System," have authorized a mortgage of \$12,000,000 upon the franchise of the company and have also authorized a contract with Albert E. Boone for the construction of the entire road through West Virginia and to include the Charleston branch.

**Waldo & Somerset.**—The company has memorialized the Legislature of Maine to the effect that public necessity and convenience require that a railroad be constructed from the terminus of the Belfast & Moosehead road in Burnham, through Canaan, Cornville, Athens, Brighton, Solon, Birmingham, Moscow, Carrattun and the Forks; thence to the Canadian Pacific near Moose River plantation; also that the charter of the company be amended so as to allow the construction of this road, should the capital stock be fixed at not less than \$100,000, and not to exceed \$200,000, and the period of three years to be allowed for the completion of the road.

**Wheeling & Lake Erie.**—Arrangements are being made for extending this line from Portland Station, O., its present Eastern terminus, to Steubenville, O. Subscriptions for the purpose are now being collected.

**Williamsport & Binghamton.**—Belden & McTighe, of New York city, have sublet the contracts for the completion of two sections, one of 28 miles, from Barbour's Mills to DuShore, and another of ten miles, from Wallace's Road to Barbour's Mills. In all, 40 miles of the road are now under construction. Work will soon begin north of Towanda, Pa. The line is to be opened from Williamsport to Towanda, Pa., by next October.

**Williamsville, Greenville & Northeastern.**—The road is now completed from Williamsville to Manning, Mo., about 5½ miles. Work is being pushed on an additional six miles, and next year the road will probably be completed to the Mississippi River.

**Winona & Southwestern.**—The survey between Mason City and Osage, Ia., is now being made. This line will give the road a connection with the Mason City & Fort Dodge, which will form part of the road. The Mason City & Fort Dodge extends from Mason City to Fort Dodge Ia., 72 miles, with two branches.

**Wisconsin Midland.**—It is reported that the Illinois Central has secured the franchise, right of way and other properties of this company, and that the company will complete part or all of the road. The officers of this company refuse to deny or confirm the report, but state that an agent is now in Europe endeavoring to secure funds for building the road. They also state that early last year the company had begun negotiations with the Illinois Central which, if successful, would have given that company control of the road. A basis of settlement could not be agreed upon, however. The line has been surveyed from Fond du Lac northward to L'Anse, Mich., and southwest to Madison, Wis.; also from Fond du Lac to Sturgeon Bay.

#### TRAFFIC AND EARNINGS.

##### Traffic Notes.

Passenger rates on the Housatonic road have been reduced to 3 cents per mile.

The Missouri Pacific's pass regulations exclude employees from riding on suburban trains into and out of St. Louis.

The rate on dressed beef from Missouri River points to Chicago has been raised from 26 cents to 28.8 cents.

Passenger fares west of Chicago have shown little change during the past week. The Chicago & Northwestern has postponed its proposed reduction between Chicago and Council Bluffs.

The Ticket Agent of the Missouri Pacific in a city office at Kansas City who sold the half-fare employees' ticket which found its way into the hands of a scalper and caused the recent reduction in the tariff between Kansas City and Colorado points by the Rock Island, has resigned. It appears that his superiors think he did not take sufficient pains to examine the credentials of the customer who claimed to be an employee.

The Canadian Pacific hauled a very heavy consignment of cotton goods from the Hochelaga Cotton Co.'s mills, at Montreal, last week, to Vancouver, whence it will be forwarded to Japan. The first shipment of cotton goods to Japan was made in 1887. It is estimated that during the past year 900 car-loads of Canadian cotton goods have been shipped to Yokohama.

A Chicago dispatch says that there are 3,500 empty cars on the tracks of the Chicago & Northwestern, and that the other roads are in the same condition. There was a tremendous rush of corn last month to catch the old east-bound tariff, and since the advance tonnage is reduced 50 per cent. on the corn roads. The rush in December is corroborated by the heavy export movement in corn during that month, the amount gone forward from the United States having been 5,272,108 bushels, against 2,179,013 bushels in December of last year.

##### Western Rates.

There is much talk at Chicago and west of there concerning the rates on live hogs and hog products from Missouri River points to Chicago. A new tariff recently issued makes the difference in rate between live hogs and hog products greater than before, and the Chicago Board of Trade has petitioned the Inter-state Commerce Commission for an investigation, charging that the rates are unduly favorable to Missouri River packers, and claiming that the rates on the two classes should be equal. The Iowa Railroad Commissioners are gathering facts for a defense of the present rates, which it is claimed are only just to the Western packers.

The rate on packing house products from Kansas City to Memphis has been raised to 24 cents, and to other Southern points in proportion.

Live stock shippers at Kansas City and other Missouri River points are complaining at the new carload rates established by the roads for the purpose of billing by the 100 lbs., instead of an estimated weight per car. The new minimum rates are claimed to be too high. Fault is also found at the discrepancy in the tariffs of the roads east and west of the Missouri River. On the latter hogs are 7½ cents higher than cattle, while east of the river they are 2½ cents lower than cattle.

The general managers of the lines west, northwest and southwest of Chicago, who have been working for two weeks on a plan for the regulation of passenger traffic, completed their labors Jan. 12. The result was the adoption of the plan proposed last September, with various amendments and modifications, but the action of the presidents' meeting may cause important amendments in the Chicago men's plans.

#### Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

##### SAN ANTONIO & ARANSAS PASS.

Year ending Dec. 31 :	1888	1887	Inc. or Dec.
Gross earnings.....	\$1,001,230	\$569,333	I. \$451,896
Oper. expenses.....	666,728	358,672	I. 308,056
Net earnings.....	\$334,501	\$210,661	I. \$123,840
Fixed charges.....	243,360	152,910	I. 90,450
Surplus.....	\$91,141	\$57,751	I. \$33,390
Other income.....	36,582	22,765	I. 13,877
Aver. miles oper.....	303	237	I. 126

##### NEW YORK CENTRAL & HUDSON RIVER.

Month of November :	Gross earnings.....	\$3,000,851	\$3,229,021	D. \$228,170
Quarter ending Dec. 31:	Gross earnings.....	9,170,880	10,020,225	D. 849,336

##### OREGON SHORT LINE.

Month of November :	Gross earnings.....	\$240,000	\$196,777	I. \$43,223
Jan. 1 to Nov. 30:	Gross earnings.....	82,240,615	\$1,666,257	I. \$580,358
Oper. expenses.....	1,129,344	1,207,505	I. 121,839	
Net earnings.....	\$1,117,271	\$658,752	I. \$458,519	

##### MONTGOMERY & ALBANY.

Month of November :	1888	1887	Inc. or Dec. P.c.
Bur., Ced. Rap. & N. ....	\$305,533	\$29,589	I. \$10,294 3.4
Net.....	134,709	109,886	I. 24,823 22.6
Cairo, Vin. & Chi. ....	65,882	67,488	D. 1,806 2.7
Net.....	22,509	18,224	I. 4,285 23.5
Central of Georgia....	797,399	762,106	I. 35,293 4.6
Net.....	309,184	333,764	D. 44,580 12.6
Central Iowa.....	125,871	138,593	D. 2,722 2.0
Net.....	195,660	49,140	I. 23,605 60.2
Ches., Ohio & S. W. ....	180,525	209,140	I. 28,315 13.5
Net.....	71,572	73,700	D. 2,128 2.9
Chi., Bur. & No. ....	288,367	154,369	I. 35,468 53.9
Net.....	80,980	7,999	I. 78,981 .....
Chi., Bur. & Quincy....	2,309,559	2,346,534	D. 115,995 4.9
Net.....	777,012	1,147,017	D. 370,905 32.3
East Tenn., Va. & G. ....	517,569	515,621	I. 1,918 1.4
Net.....	181,149	217,727	D. 36,578 16.8
Minn. & St. Louis....	140,000	147,684	D. 7,084 4.8
Net.....	62,647	59,290	I. 3,397 5.7
Ore. Ry. & Nav. Co. ....	613,273	616,057	D. 784 .1
Net.....	241,516	358,975	I. 117,459 32.7
Southern Pacific Co.:			
Gal., Har. & S. Ant. ....	398,156	201,208	I. 106,948 36.7
Net.....	141,960	86,709	I. 55,231 63.7
Louisiana West....	97,375	76,914	I. 20,461 26.8
Net.....	57,629	41,864	I. 15,835 37.8
Morgan's La. & Tex. ....	587,008	554,584	I. 32,424 5.8
Net.....	194,838	249,036	I. 5,802 23.3
N. Y. Tex. & Mex. ....	16,108	13,157	I. 2,931 24.0
Net.....	404	1,469	D. 1,035 71.0
Tex. & N. Orleans....	111,941	108,391	I. 33,550 31.0
Net.....	57,905	40,091	I. 17,514 44.4
Tot. Atlan. System....	1,249,588	1,044,235	I. 195,333 18.8
Net.....	512,811	419,168	I. 93,413 22.3
Tot. Ohle Central....	105,122	111,227	D. 2,105 1.9
Net.....	43,431	48,226	D. 4,295 8.9
Union Pacific.....	2,636,238	2,597,585	I. 38,638 1.5
Net.....	1,016,639	1,171,510	D. 154,871 13.2

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

##### East bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, Jan. 12, amounted to 73,386 tons, against 103,664 tons during the preceding week, a decrease of 30,278 tons, and against 59,949 tons during the corresponding week of 1888, an increase of 13,437 tons. The following table gives the proportions carried by each road:

	Wk to Jan. 5.	Wk to Jan. 12.		
	Tons.	P. c.	Tons.	P. c.





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